Amsterdam UMC
University Medical Centers

How to select an outcome measurement instrument: the COSMIN methodology

LIBM – 15/07/2021

Wieneke Mokkink

Selecting a measurement instrument: not an easy task

- Overload of instruments
- 9 measurement properties + feasibility + interpretability
- How should you select the best instrument?
  - Understanding the quality of studies & the quality of measurement instruments

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No consensus

- Terminology & definitions of the relevant measurement properties
- Guidelines for systematic reviews on outcome measurement instruments

2005 start of COSMIN initiative

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The COSMIN initiative

COSMIN aims to **improve the selection** of outcome measurement instruments both in research and in clinical practice by developing **systematic and transparent methodology** and **practical tools** for selecting the most suitable outcome measurement instrument.

You can use our tools to improve the way you do research and the trustworthiness of your results.

COSMIN

COSMIN Delphi studies

Delphi study content validity

1st Delphi study

VENI study

2005

2010

2015

2018

2021

PRISMA study

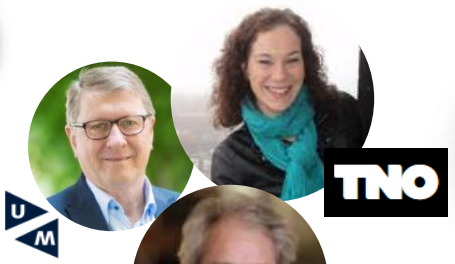
COMET study

PCORI study

COSMIN

COSMIN studies

Delphi study content validit



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PRISMA study

COMET study

PCORI study

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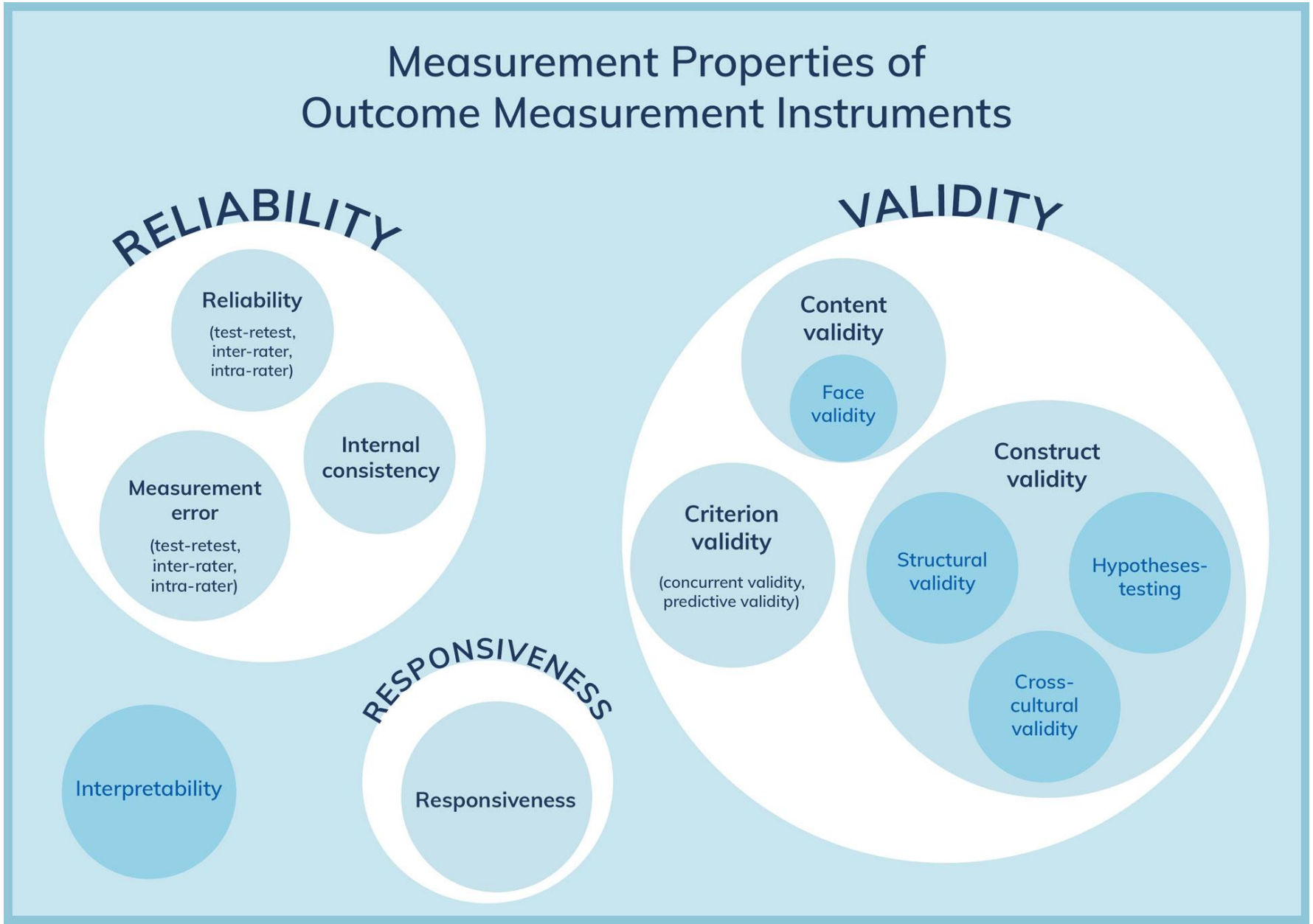
A-Z

COSMIN Taxonomy

Get the definition of your measurement properties clear with our consensus-based taxonomy of measurement properties.

USE THIS TOOL ›

COSMIN TAXONOMY



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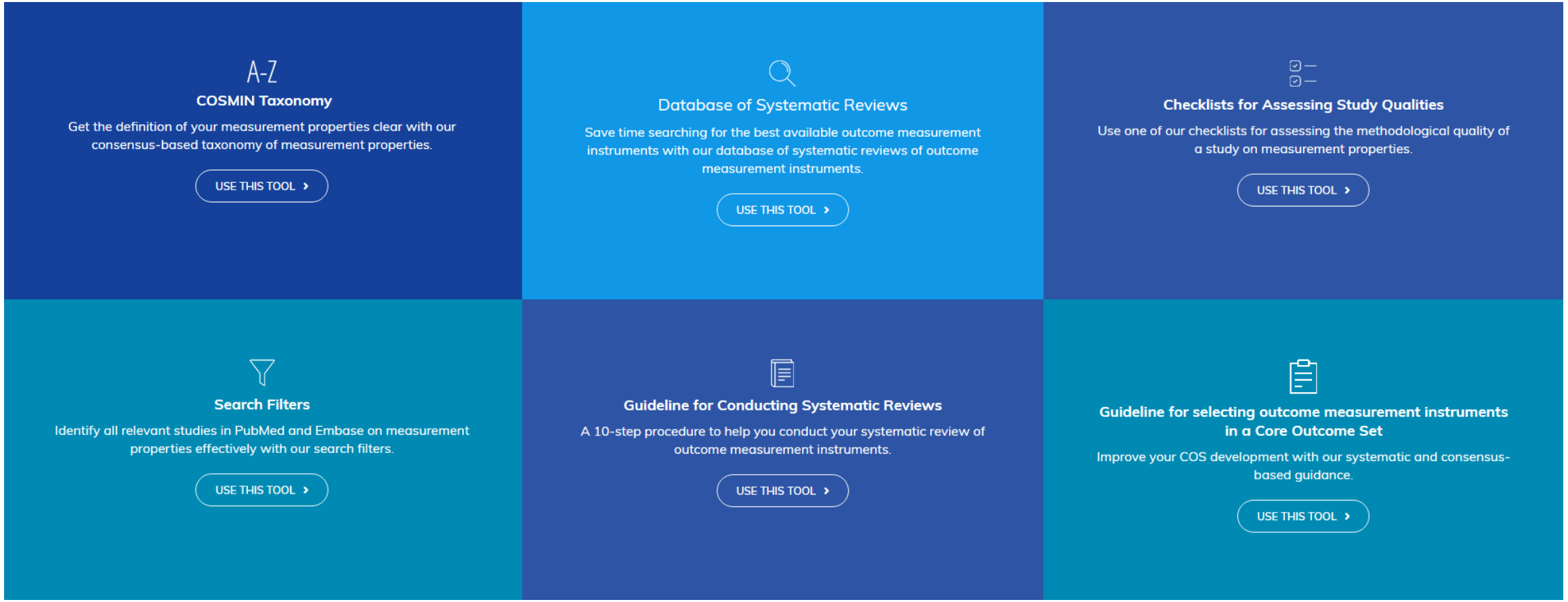
Our tools: see https://COSMIN.nl



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How to select the most suitable instrument?

1. What do you want to measure?
2. Which instruments are available to measure the specific construct?

   & Where can I find the instrument?
3. Which one to choose? Or should you develop one yourself?

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What do you want to measure? Define the construct to be measured

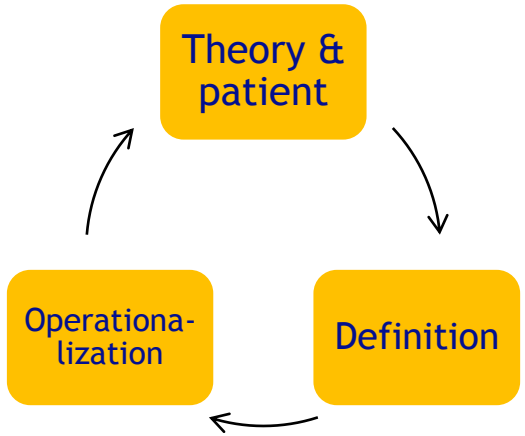
Definition is a statement of your understanding of the ‘thing’ you want to measure

Source

- Theory and research based (conceptual model)
- Patient based (interviews, focus group)

Circular process

- Draft
- More precise definition



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What do you want to measure??

No right and wrong

Understand what you want to measure, and what you don’t want to measure

To avoid confusion: are we talking about the same?

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Activity limitations

- Activity - execution of a task or action by an individual
- Activity limitations - difficulties an individual may have in executing activities

What can an individual do in a ‘standardised’ environment

Construct: capacity

Type: performance based test

What does the person actually in his /her ‘daily’ (usual) environment

Construct: performance

Type: questionnaire (PROM)

World Health Organization. ICF: international classification of functioning, disability and health. Geneva: World Health Organization; 2001.

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CONCEPTUAL MODEL: Wilson and Cleary

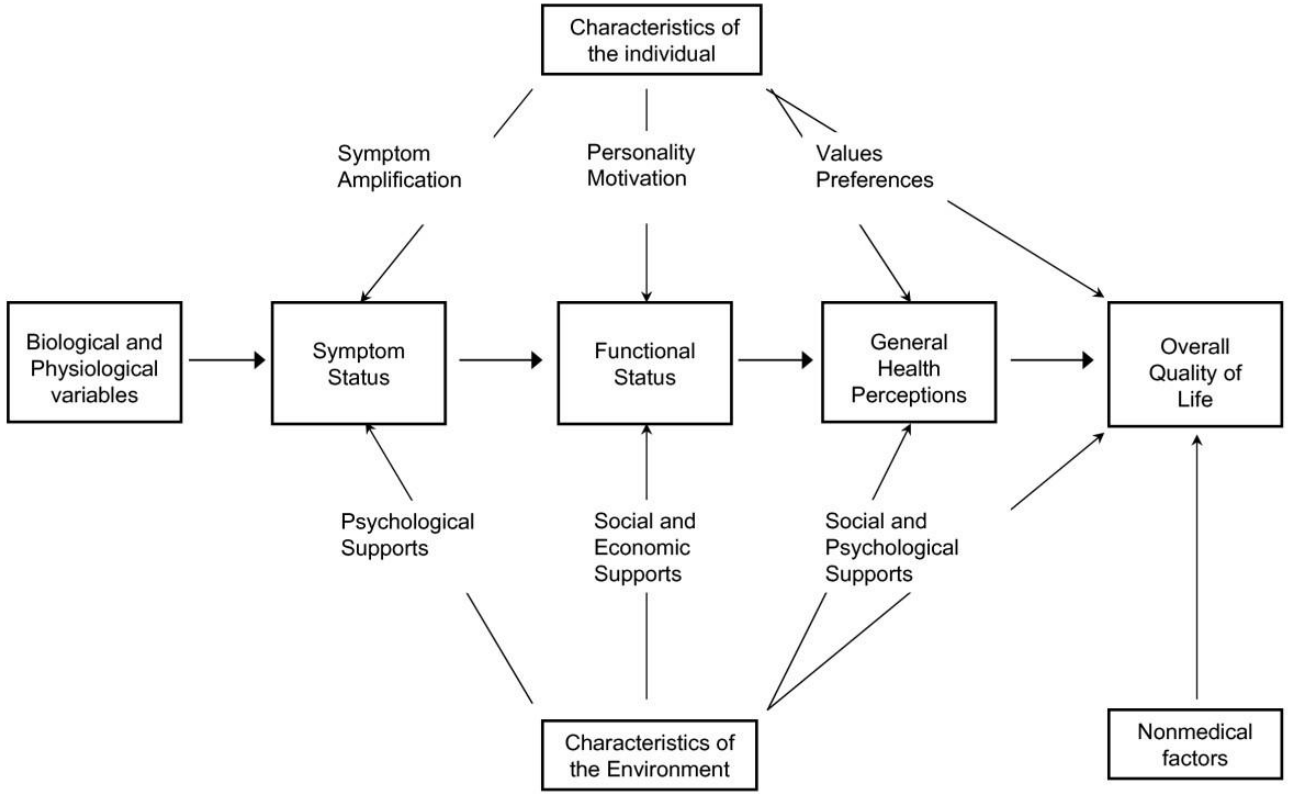

Figure: Relationships between measures of patient outcome in an HRQL conceptual model.

Wilson IB, Cleary PD. Linking clinical variables with health-related quality of life.
A conceptual model of patient outcomes. JAMA. 1995 Jan 4;273(1):59-65.

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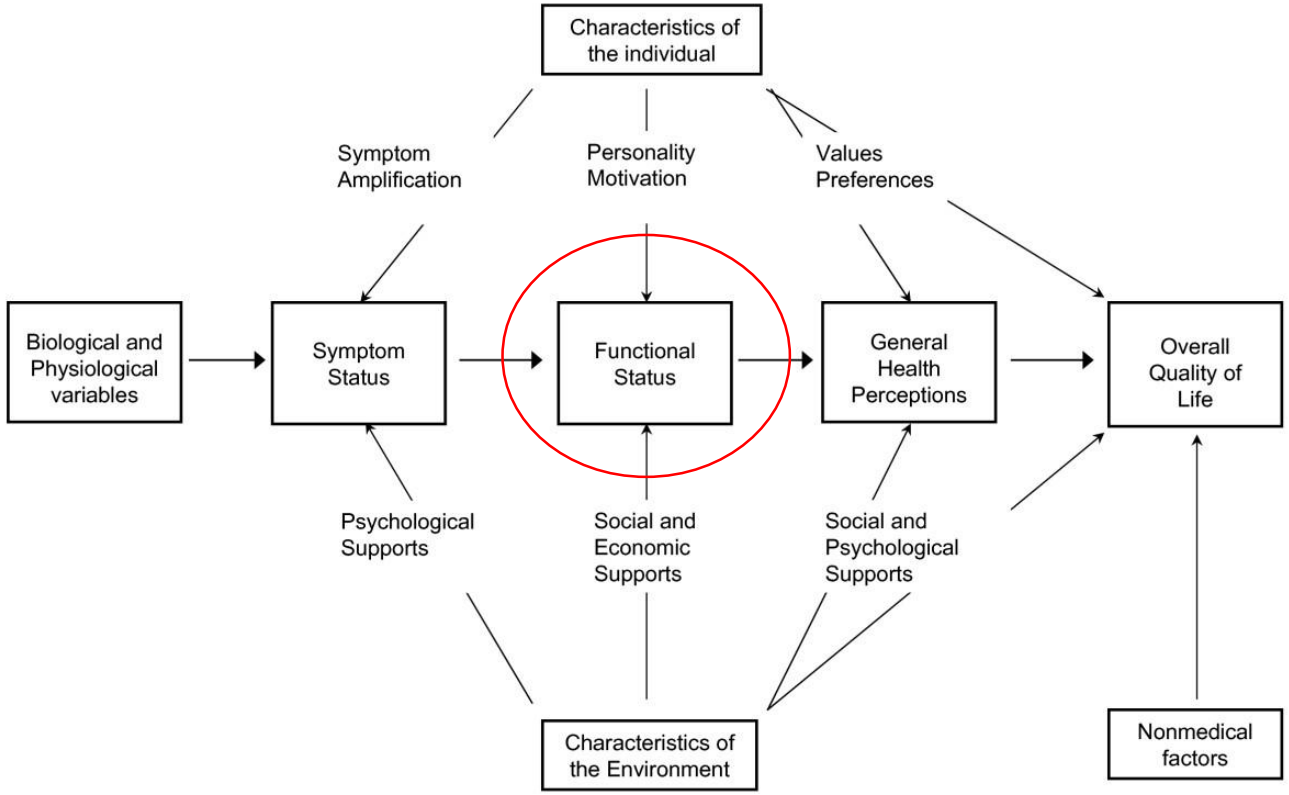

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A conceptual model of patient outcomes. JAMA. 1995 Jan 4;273(1):59-65.

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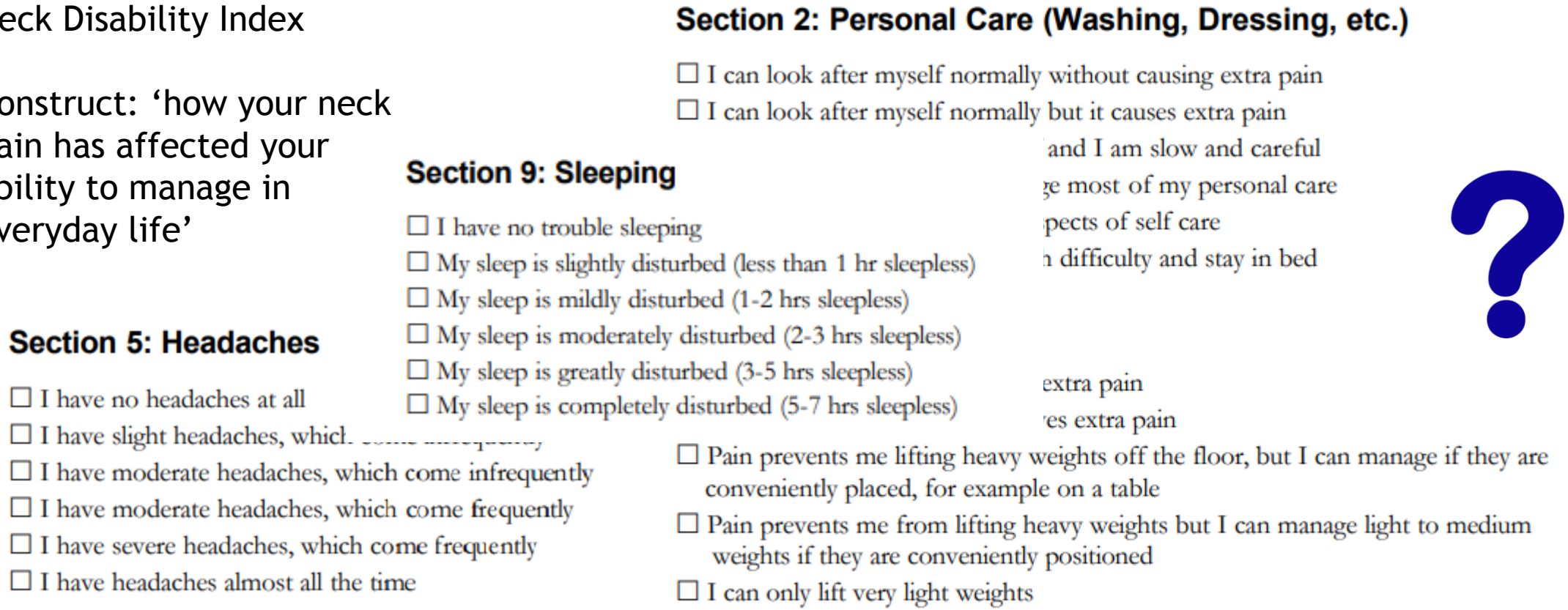
Measuring pain or physical functioning (ADL)?

Neck Disability Index

Construct: ‘how your neck pain has affected your ability to manage in everyday life’



Section 2: Personal Care (Washing, Dressing, etc.)

- ☐ I can look after myself normally without causing extra pain
- ☐ I can look after myself normally but it causes extra pain
- and I am slow and careful
- ge most of my personal care
- pects of self care
- n difficulty and stay in bed

Section 9: Sleeping

- ☐ I have no trouble sleeping
- ☐ My sleep is slightly disturbed (less than 1 hr sleepless)
- ☐ My sleep is mildly disturbed (1-2 hrs sleepless)
- ☐ My sleep is moderately disturbed (2-3 hrs sleepless)
- ☐ My sleep is greatly disturbed (3-5 hrs sleepless)
- ☐ My sleep is completely disturbed (5-7 hrs sleepless)

Section 5: Headaches

- ☐ I have no headaches at all
- ☐ I have slight headaches, whic
- ☐ I have moderate headaches, which come infrequently
- ☐ I have moderate headaches, which come frequently
- ☐ I have severe headaches, which come frequently
- ☐ I have headaches almost all the time

extra pain

es extra pain

- ☐ Pain prevents me lifting heavy weights off the floor, but I can manage if they are conveniently placed, for example on a table
- ☐ Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned
- ☐ I can only lift very light weights

Vernon, H. & Mior, S. (1991). Journal of Manipulative and Physiological Therapeutics. 14, 409-415

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http://www.comet-initiative.org/

Core Outcome Set Studies

Search the COMET database

The keyword used for the search will be c
study title, abstract and author's surname

cardiovascular

Search Database

Click here for advanced search

Disease Name	Study Title	Year	Study Type	Disease Category	Authors	
- Peripheral Vascular Disease - Peripheral Arterial Disease	Core OutcoMe set in Intermittent Claudication: The COMIC Study	Ongoing	- COS for clinical trials or clinical research - COS for practice	- Heart & circulation	Viknesh Sounderajah Calvin Chan, Imperial College London Pasha Normahani, Imperial College London Amish Acharya, Imperial College London Lydia Han...	Show Study
- Cardiovascular Disease	Core outcomes in clinical safety evaluation for cardiovascular disease in traditional Chinese medicine and western medicine	Ongoing	- COS for clinical trials or clinical research - COS for practice	- Heart & circulation	Ruijin Qiu and Hongcai Shang are the principal investigators.	Show Study
- Chronic heart failure	Developing a Core outcome set of Traditional Chinese Medicine on Chronic Heart Failure	Ongoing	- COS for clinical trials or clinical research - COS for practice - Recommendations for outcome measures (measurement/how)	- Heart & circulation	Principal investigator: Junhua Zhang,Mingyan Zhang,Evidence-Based Medicine Center,Tianjin University of Traditional Chinese Medicine,Tianjin,China ...	Show Study
			- COS for clinical trials or clinical	- Child health	Dr Cíntia E. Botton- Exercise Pathophysiology Research Laboratory and National Institute of	Show Study

Search Results

Your search returned **37** results for 23 Core Outcome Set studies.

Your search returned **16** results for other studies. To see those other studies click here.

Download search results

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Database of systematic reviews of outcome measurement instruments

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https://database.cosmin.nl/

All Fields | Search... | Search

Level of health

- Biological and physiological variables
- Symptom status
- Functional status
  - Cognitive/mental functioning 26
  - Physical functioning ✖ 196
  - Role functioning 55
  - Social functioning 61
- General health perceptions / HRQoL
- Overall quality of life

Characteristics of population

- Age
  - Adults (18-65) ✖ 196
  - Children (0-18) 58
  - Seniors (65+) 155
- Disease

You searched for: Age > Adults (18-65) ✖ | Start Over

Disease > Diseases of and symptoms related to the musculoskeletal system and connective tissue ✖

Functional status > Physical functioning ✖

« Previous | **1 - 10** of **196** | Next »

Sort by publication date (descending) | 10 per page

1. Measurement Properties of Isokinetic Dynamometry for Assessment of Shoulder Muscle Strength: A Systematic Review — Bookmark

Author: Sørensen, L., Oestergaard, L. G., van Tulder, M., and Petersen, A. K.

Publication year: 2021

DOI: 10.1016/j.apmr.2020.06.005

2. Measurement Properties of Outcome Measures Used to Assess Physical Impairments in Patients After Distal Radius Fracture: A Systematic Review — Bookmark

Author: Ziebart, C., Mehta, S. P., and MacDermid, J.

Publication year: 2021

DOI: 10.1093/ptj/pzab080

https://database.cosmin.nl/

Instrument | TSK - Tampa Scale for Kinesiophobia | Search

More search options

Limit your search

Level of health

- Biological and physiological variables
- Symptom status
- Functional status
- General health perceptions / HRQoL
- Overall quality of life

Characteristics of population

- Age

Export results page

You searched for: Instrument > TSK - Tampa Scale for Kinesiophobia

Start Over

1 - 4 of 4

Sort by relevance | 10 per page

1. Pain-related fear: a critical review of the related measures

Bookmark

Author: Lundberg, M., Grimby-Ekman, A., Verbunt, J., and Simmonds, M. J.

Publication year: 2011

DOI: 10.1155/2011/494196

2. Are validated outcome measures used in distal radial fractures truly valid? A critical assessment using the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) checklist

Bookmark

Author: Kleinlugtenbelt, Y. V., Nienhuis, R. W., Bhandari, M., Goslings, J. C., Poolman, R. W., and Scholtes, V. A.

https://eprovide.mapi-trust.org

Roland-Morris Disability Questionnaire (RMDQ)

Morris R; Roland MO

- *Basic description*
- *Contact and conditions of use*
- *Review copy*
- *Languages*
- *E-versions*
- *Descriptive information*

PROQOLID™

BASIC DESCRIPTION

Developed in 1983

Authors
Morris R; Roland MO

Copyright
Public domain

Objective
To assess physical disability due to low back pain

Therapeutic area

- Pathological Conditions, Signs and Symptoms

Therapeutic indication
Back Pain

Type of Clinical Outcome Assessment (COA)

PRO

Original language(s)

- English for the UK

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Perform a review: COSMIN methodology

PROMs:

- Consecutive ten-step procedure for conducting a systematic review specifically for patient-reported outcome measures (PROMs)

Other types of instruments:

- Adapted COSMIN methodology for Clinician-reported outcome measures, performance-based tests, and laboratory values

Prinsen CAC, et al. Qual Life Res. 2018 May;27(5):1147-1157.
Mokkink et al. BMC Med Res Meth. Preprint: https://doi.org/10.21203/rs.3.rs-40864/v1
Manuals available at www.cosmin.nl

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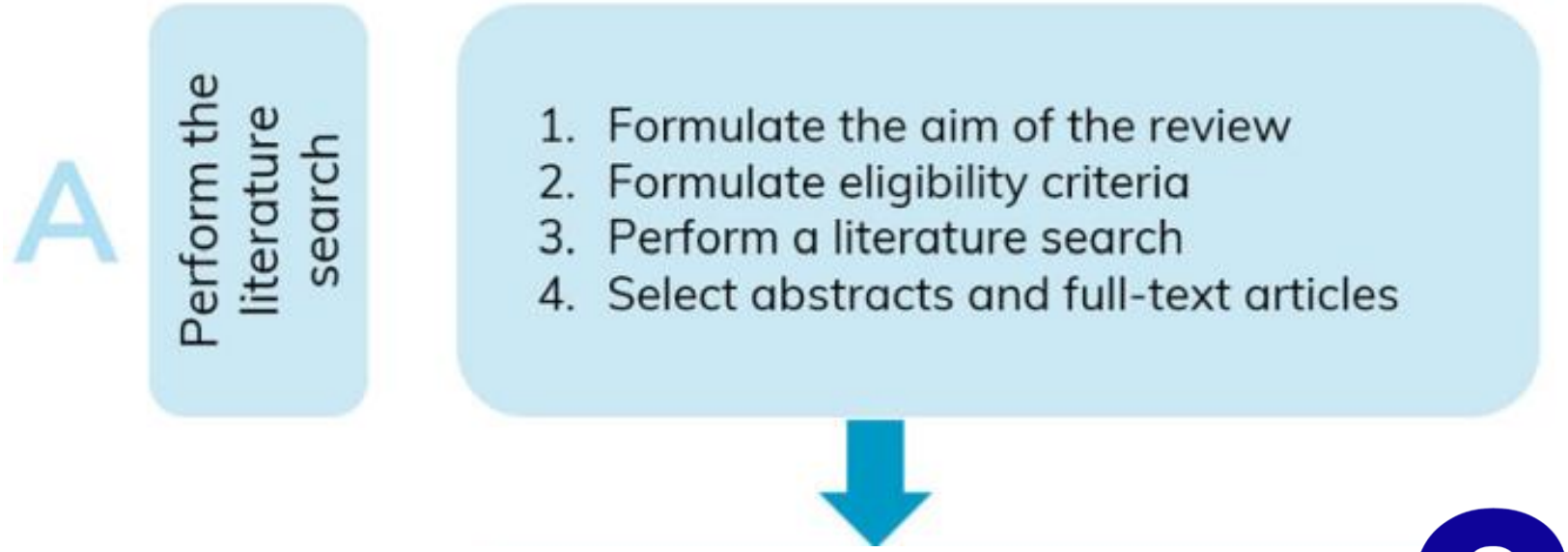
COSMIN systematic review



Clinimetric search filter

?

Prinsen CAC, et al. Qual Life Res. 2018 May;27(5):1147-1157.
Terwee et al. Qual Life Res. 2009 Oct;18(8):1115-23.

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How to select the most suitable instrument?

1. What do you want to measure?
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   & Where can I find the instrument?
3. Which one to choose?
   - Feasibility
   - Interpretability
   - Quality

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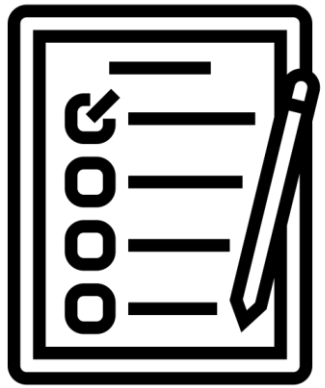
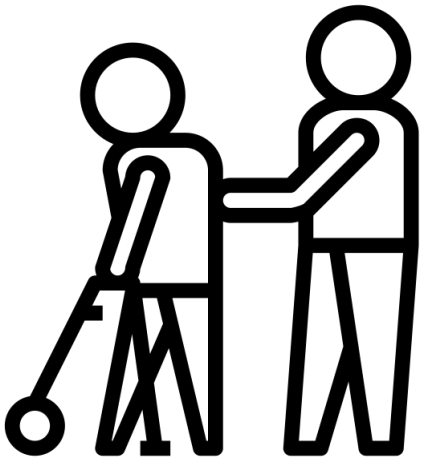
Feasibility aspects

- Burden to patient
- Burden to professional
- Time
- Costs



Created by Wichai Wi
from Noun Project



Created by Becris
from Noun Project

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Interpretability

The degree to which one can assign qualitative meaning to an instrument's quantitative scores or changes in scores

- Distribution of scores (norm scores)
- Floor & ceiling effects
- MIC values
- Response shift

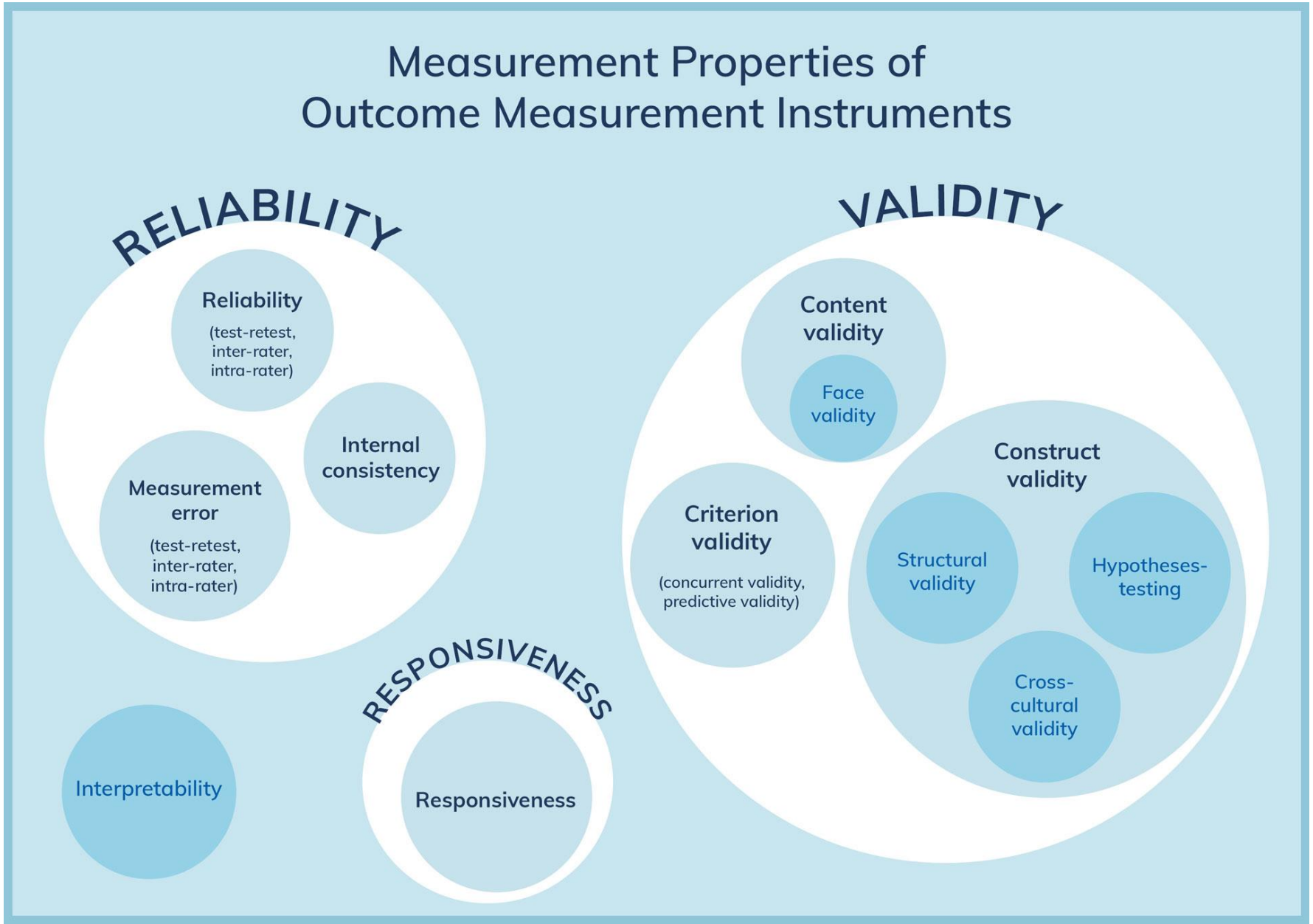
A-Z

COSMIN Taxonomy

Get the definition of your measurement properties clear with our consensus-based taxonomy of measurement properties.

USE THIS TOOL ›

Quality aspects



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Content validity

The degree to which the content of a measurement instrument is an adequate reflection of the construct to be measured

Qualitative analysis of the (multi-item) instrument to verify:

- Comprehensibility
- Relevance
- Comprehensiveness

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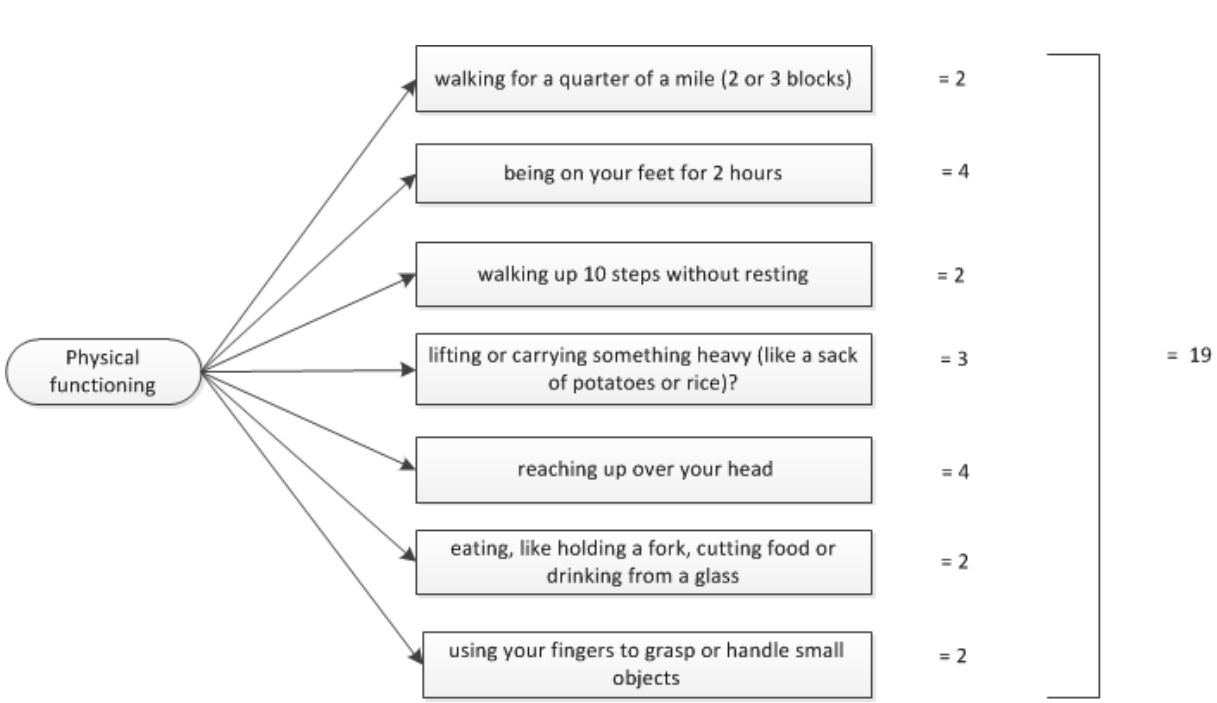
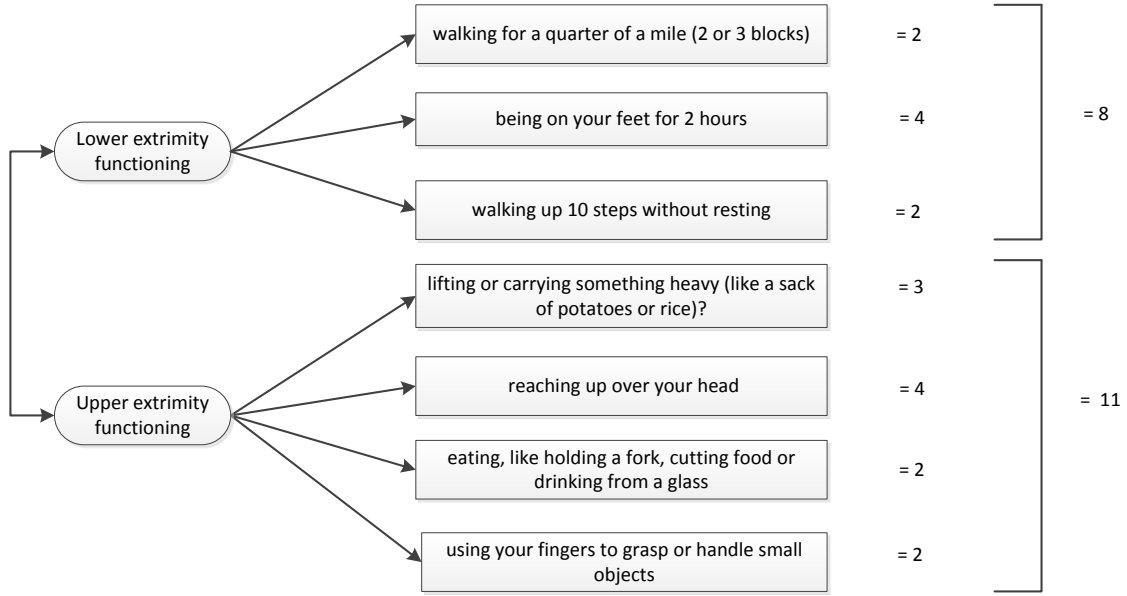
Structural validity

Which items measure the same (sub) construct? How to calculate scores?

Factor analysis





Item range 0-4

Adapted from https://www.cdc.gov/nchs/data/nhanes/nhanes_09_10/pfq_f.pdf

Measurement error (agreement in scores)

How close are the scores of repeated measurements in stable patient?

the absolute deviation of the scores or the amount of error

- expressed in the unit of measurement
- standard error of measurement (SEM), percentage specific agreement

Reliability

- ‘Can I generalize a score obtained by one rater with a specific machine to that of another rater with another machine?’

- What are opportunities to improve the measurement?
  - Better standardization of the instructions to the raters?
  - Restriction of specific equipement?
  - Standardization of the moment of the day?

Other measurement properties

- Internal consistency
- Cross-cultural validity\measurement invariance
- Hypotheses testing for construct validity
- Responsiveness
- Criterion validity

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QUOTE

"Researchers are more inclined to use each other's toothbrush than each other's measurement instrument"

Susan Picavet
(thesis, 2001)

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Developing new instrument

Conduct qualitative research with involvement of experts

- patients and professionals
  e.g. focus groups, interviews, Delphi studies

1. Define construct
2. Elicitate the content
   - Relevance
   - Comprehensiveness
3. Develop content (items, tasks, instructions, response options, measurement protocol)
   - comprehensibility

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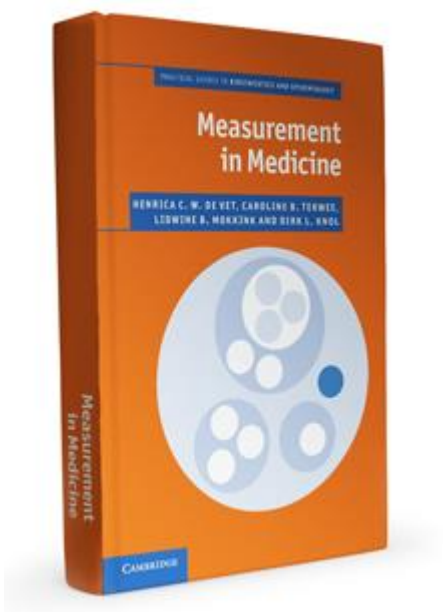
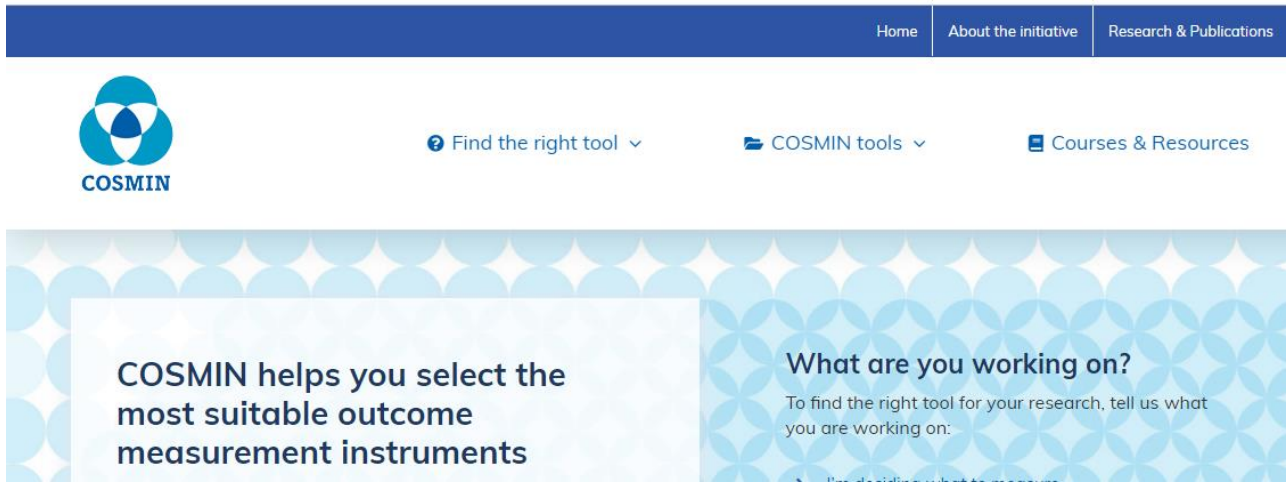
Courses & resources





WV40: Clinimetrics: Assessing Measurement Properties of Health Measurement Instruments