

Psychological attributes and substantive domains

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The use of testing

Definitions

Types of tests

Substantive domains

The use of testing

Definitions

Types of tests

Substantive domains

The use of testing

Definitions

Types of tests

Substantive domains

Aims of this session

- ▶ At the end of this session, you should:
 - ▶ Understand the relevance of measurement in psychological practice
 - ▶ Define the basic terms used in psychological testing
 - ▶ Have an overview of the different types of testing practices

The use of testing

Definitions

Types of tests

Substantive domains

3

The use of testing

Definitions

Types of tests

Substantive domains

The use of testing

Definitions

Types of tests

Substantive domains

4

What is testing?

- ▶ Psychological testing is a field of psychology that focuses on the assessment of psychological dimensions or phenomena.
- ▶ Testing is used intensively in psychological practice (clinical assessment, personnel selection, student orientation, etc.) as well as in research (clinical trials, program assessment, personality, achievement, etc.).

The use of testing

Definitions

Types of tests

Substantive domains

5

The use of testing

- ▶ Testing involves gathering information in order to make **informed decisions**.
- ▶ Assessment is used to:
 - ▶ Rank individuals
 - ▶ Categorize individuals
 - ▶ Diagnose
 - ▶ Measure change or progress
 - ▶ Predict outcomes
 - ▶ Provide certification / graduation / access to something

The use of testing

Definitions

Types of tests

Substantive domains

6

Imperfect information

- ▶ Obviously, tests do not provide perfect information...
- ▶ ...but the information that they bring CAN be improved...
 - ▶ Through a discipline called **psychometrics**.
- ▶ ...and MUST be improved!
 - ▶ Why? Because wrong information frequently leads to bad decisions!

The use of testing

Definitions

Types of tests

Substantive domains

7

Corollaries

- ▶ Two important corollaries for you:
 - ▶ You need to be able to assess the quality of tests to select the right ones in your practice and research
 - ▶ You need to take into account, in both your practice and research, the quality of the information provided by a test that you use, and act accordingly.
- ▶ It's not an option, nor a specialty. If you use tests, as a Psychologist, it's a requirement:
 - ▶ "Psychologists use assessment instruments whose validity and reliability have been established for use with members of the population tested. When such validity or reliability has not been established, psychologists describe the strengths and limitations of test results and interpretation." Ethical Principles of Psychologists and Code of Conduct 9.02(b)

The use of testing

Definitions

Types of tests

Substantive domains

8

Psychometrics

- ▶ The field that is concerned about the development, the evaluation and the improvement of tests is **psychometrics**.
- ▶ Psychometrics is metrology (the science of measurement), applied on psychological dimensions.
- ▶ Because psychometrics has been very focused on measuring mental abilities and knowledge, it is also very close to docimology (the science of student evaluation), also called educational testing.
 - ▶ An example of that is the fact that the standards for testing are jointly adopted and developed by the American Psychological Association (APA), American Educational Research Association (AERA) and National Council on Measurement in Education (NCME)

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

9

The use of testing

Definitions

Types of tests

Substantive domains

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

10

Definitions

Tests

People

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

11

Tests

- ▶ A psychological test is a “measurement device or technique used to quantify behavior or aid in the understanding and prediction of behavior”. (Kaplan & Sacuzzo, 2009)
- ▶ Tests are primarily used to understand or infer on someone’s behaviors:
 - ▶ Thoughts
 - ▶ Knowledge
 - ▶ Abilities
 - ▶ Opinions
 - ▶ Job performance
 - ▶ Academic performance
 - ▶ Clinical outcomes
 - ▶ etc.

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

12

Similarities between all tests

- ▶ They require (implicitly or explicitly) test takers to perform an **observable behavior**.
 - ▶ E.g., to solve a mathematics problem, to answer "yes" or "no" to a question
- ▶ The behavior is used to measure a psychological attribute, called a **construct**.
 - ▶ E.g., numerical reasoning, extroversion
- ▶ The test procedure (including the scoring) is systematic
 - ▶ Tests are planned, standard across test takers, and thoroughly used

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

13

Constructs and observed behaviors

- ▶ Note an important distinction in testing between observations and constructs.
- ▶ Observations are **observed** (also called **manifest**) (e.g. The examinee's response is correct or incorrect, The examinee responded "Totally agree" to "I love going to parties.").
- ▶ Constructs are **unobserved** or **latent** (e.g. The examinee's logical reasoning ability, the examinee's extroversion).
- ▶ Constructs are only estimated through the observations, but not directly observed.
- ▶ Several implications:
 - ▶ Constructs may be inaccurately measured (because the observations for examp)

40

Tests

- ▶ A psychological test is a “measurement device or technique used to *quantify* behavior or aid in the understanding and prediction of behavior”. (Kaplan & Sacuzzo, 2009)
- ▶ Note that this definition is overly restrictive to an objective of “quantifying” (to constructs that are assumed to be distributed among individuals in a continuum, like openness). Tests can perfectly be used to categorize into classes, for example (e.g. Clinical vs. Non-Clinical Depression, Eligible for a job vs. Not Eligible).
- ▶ An interesting discussion on the distribution of constructs: Borsboom, D., Rhemtulla, M., Cramer, A. O. J., Maas, H. L. J. van der, Scheffer, M., & Dolan, C. V. (2016). Kinds versus continua: a review of psychometric approaches to uncover the structure of psychiatric constructs. *Psychological Medicine*, 46(8), 1567–1579.

14

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

15

Similarities between all tests

- ▶ The dimension measured is meant to describe, explain or predict some behavior.
 - ▶ For example, how well a child is currently performing —or is going to perform —in a subject at school

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

15

Similarities between all tests

- ▶ The dimension measured is meant to describe, explain or predict some behavior.
 - ▶ For example, how well a child is currently performing —or is going to perform —in a subject at school
- ▶ The behavior that is explained or predicted can also serve to explain or predict secondary outcomes.
 - ▶ For example, the child's social integration, ability in a domain, academic success, or professional success.

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

16

Definitions

Tests

People

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

17

Test people

- ▶ It will be useful for the rest of the course to define who the different actors are in psychological testing.
- ▶ Here's an attempt at a taxonomy.

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

18

Test people

- ▶ In the testing process, individuals have different roles:
 - ▶ Test authors, also called developers
 - ▶ They conceive, prepare, and develop tests. They also find a way to disseminate their tests, by publishing them either commercially or through professional publications such as books or periodicals.
 - ▶ Test publishers, also called editors
 - ▶ They publish, market, and sell tests, thus controlling their distribution.

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

19

Test people

- ▶ In the testing process, individuals have different roles:
 - ▶ Test reviewers
 - ▶ They prepare evaluative critiques of tests based on their technical and practical merits.
 - ▶ Test users
 - ▶ They select or decide to take a specific test off the shelf and use it for some purpose. They may also participate in other roles, e.g., as examiners or scorers.

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

20

Test people

- ▶ In the testing process, individuals have different roles:
 - ▶ Test administrators or examiners
 - ▶ They administer the test either to one individual at a time or to groups.
 - ▶ Test takers or examinees
 - ▶ They take the test by choice or necessity.

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

21

Test people

- ▶ In the testing process, individuals have different roles:
 - ▶ Test scorers
 - ▶ They tally the raw responses of the test taker and transform them into test scores through objective or mechanical scoring or through the application of evaluative judgments.
 - ▶ Test score interpreters
 - ▶ They interpret test results to their ultimate consumers, who may be individual test takers or their relatives, other professionals, or organizations of various kinds.

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

22

Test people

- ▶ It's important to recognize that different actors of the testing process may have:
 - ▶ Different needs
 - ▶ Different backgrounds
 - ▶ Different previous experience with tests
 - ▶ Different understanding of psychometrics
 - ▶ Different opinions and attitudes about the test
 - ▶ Different opinions and attitudes about tests in general
 - ▶ Different opinions and attitudes about psychology
 - ▶ Different expectations regarding the test results
 - ▶ Different consequences from the test results

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

23

For Psychologists...

- ▶ Psychologists that use and administer tests, they are in general are expected to:
 - ▶ To use accurate tests
 - ▶ To use them appropriately and accurately
 - ▶ To understand and account for their limitations
 - ▶ To take context into account in their interpretation
- ▶ (But be prepared: This is not always the case for all actors involved.)

40

The use of testing

Definitions

Tests

People

Types of tests

Substantive domains

24

Exercise

- ▶ In these situations, what are the probable roles of the different people involved in testing? How could they differ and what are the consequences of these potential differences?
 - ▶ A private practice clinical psychologist has a client take the Rorschach, suspecting that the client has a bipolar disorder.
 - ▶ A job interviewer is asked by their superior to have all prospects take a personality inventory prior to the interview. The interviewer is a Psychologist, but is not being given any information about the test.

40

The use of testing

Definitions

Types of tests

Substantive domains

25

The use of testing

Definitions

Types of tests

Substantive domains

40

The use of testing

Definitions

Types of tests

Substantive domains

26

A taxonomy of tests

- ▶ There are many ways to categorize tests.
- ▶ This as well is a tentative taxonomy that will help us communicate.

40

The use of testing

Definitions

Types of tests

Substantive domains

27

Differences between tests

- ▶ The behavior performed by the test taker
 - ▶ e.g., solving a problem vs. other-reporting usual behaviors
- ▶ The substantive (sub)domain
 - ▶ e.g., math ability vs. depression
- ▶ The distribution of the construct
 - ▶ e.g., a normally distributed continuum vs. 2 unordered classes
- ▶ The targeted population (age, language, etc.)
 - ▶ e.g., children vs. adults

40

The use of testing

Definitions

Types of tests

Substantive domains

28

Differences between tests (continued)

- ▶ The mode of administration
 - ▶ e.g., Individually vs. by group, orally vs. on paper vs. on computer, etc.
- ▶ How they are scored and interpreted
 - ▶ e.g., by computer vs. by a person, with norms and/or thresholds, etc.
- ▶ Their psychometric properties
 - ▶ e.g., two numerical reasoning tests may perform differently in measuring numerical reasoning

40

The use of testing

Definitions

Types of tests

Substantive domains

29

Type of behavior performed by the taker

- ▶ Most tests fall into one of these three categories, depending on the type of behavior required from the test taker:
 - ▶ Tests of maximal performance
 - ▶ The taker has a task to perform as well/quick/precisely/creatively/etc. as possible
 - ▶ Behavior observation tests
 - ▶ The taker is observed as to how he/she responds to a particular context/stimulus
 - ▶ Self (or other) report tests
 - ▶ Test takers (or people who know them) describe their usual feelings, beliefs, actions, opinions, etc.

40

The use of testing

Definitions

Types of tests

Substantive domains

30

Scoring procedures

- ▶ Scoring procedures typically fall into one of these categories:
 - ▶ Standardized tests
 - ▶ The score of the taker is used in reference to norms acquired on a standardization sample.
 - ▶ The score can be compared to a threshold that is meaningful (e.g., a clinical threshold) or to the statistical distribution in the sample.
 - ▶ Non-standardized tests
 - ▶ Scores are used in reference to values that are decided on but not based on observations made on a standardization sample.

40

The use of testing

Definitions

Types of tests

Substantive domains

31

Test-taking situation

- ▶ Tests can be categorized depending on how they can or cannot be used :
 - ▶ **Individual** tests can be given to only one person at a time. (e.g. : WAIS IV)
 - ▶ **Group** tests can be administered to more than one person at a given time. (e.g. : The Standard Progressive Matrices, the TOEIC, academic tests)
 - ▶ Usually, group tests can also be taken individually. However, the two conditions may have different norms. Usually because of the induced distractions, performances are lower in group testing settings, which is accounted for in the norms.

40

The use of testing

Definitions

Types of tests

Substantive domains

32

Test-taking situation

- ▶ Advantages of **individual** testing
 - ▶ Possibility to do some adaptative testing (presenting items of appropriate difficulty if the individual is more or less proficient)
 - ▶ More possibilities to measure other variables than the correctness of the response (e.g. : Response time, number of mistakes before correct answer, strategy used, etc.)
 - ▶ Less cheating possibilities and distractions
- ▶ Advantages of **group** testing
 - ▶ More convenient
 - ▶ Usually quicker
 - ▶ Lower expertise required for the tester (because less "unplanned" interactions)

40

The use of testing

Definitions

Types of tests

Substantive domains

33

The use of testing

Definitions

Types of tests

Substantive domains

40

The use of testing

Definitions

Types of tests

Substantive domains

34

What is measured

- ▶ Tests are often categorized by the psychological field that the construct belongs to. We generally call these **substantive domains** of measurement.
- ▶ Substantive (the "what") is used as opposed to methodological (the "how").
- ▶ For example, self-report tests and projective tests can be thought as two methodological approaches to the measure of the substantial domain of personality.

40

The use of testing

Definitions

Types of tests

Substantive domains

35

Substantive domains

- ▶ Achievement tests
 - ▶ Assess knowledge and previous learning in a specific academic domain.
- ▶ Aptitude tests
 - ▶ Measure the capacity, the potential to learn a specific skill.
- ▶ Skill tests
 - ▶ Measure a targeted acquisition of skills (e.g. language).
- ▶ General Mental Ability (GMA) tests
 - ▶ Measure the general ability to learn and cope with an environment and its constraints.

40

The use of testing

Definitions

Types of tests

Substantive domains

36

Substantive domains

- ▶ Interest tests
 - ▶ Assess an individual's vocation and interests to provide information for making career decisions.
- ▶ Attitudes/opinions tests
 - ▶ Assess how an individual reacts to an event/person/idea/movement/etc..
- ▶ Personality tests
 - ▶ Assess character or disposition to understand an individual's "normal" personality traits.

40

The use of testing

Definitions

Types of tests

Substantive domains

37

Substantive domains

- ▶ Clinical assessment tests
 - ▶ Test either basic cognitive functions (memory, language, perception, visual-spatial) to diagnose cognitive disorders
 - ▶ Test an individual's character to diagnose personality/mood disorders (in a broad sense) (e.g. psychopathy, depression)
- ▶ Quality of Life/Well-Being/Psycho-social health tests
 - ▶ Test psychological health with a focus on the group rather than the individual (e.g., satisfaction with life within an hospital department, etc.)
- ▶ Neurological tests
 - ▶ Uses physiological measures (e.g. Functional MRI) to diagnose or understand neurological conditions

40

The use of testing

Definitions

Types of tests

Substantive domains

38

A side note

- ▶ The categorization in substantive domains here presented is subjective and debatable, but it is useful:
 - ▶ To discuss potential methodological practices involved (e.g., Testing practices in the study of language acquisition largely differs from testing practices in the measurement of personality traits).
 - ▶ To discuss methodological challenges and substantive questions encountered (e.g., For clinical assessment, whether a construct should be considered a class or a trait is an important consideration, whereas it is rarely the case in ability testing).

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Exercise

- ▶ Here are example items from the Army Alpha Test used for army recruits during WWI. What domain is measured? Why could the aim(s) of the test be?
 - ▶ A company advanced 6 miles and retreated 2 miles. How far was it then from its first position?
 - ▶ A dealer bought some mules for 1,200 dollars. He sold them for 1,500, dollars, making 50 dollars on each mule. How many mules were there?
 - ▶ Thermometers are useful because:
 1. They regulate temperature
 2. They tell us how warm it is
 3. They contain mercury
 - ▶ Unscramble the words to form a sentence, and then indicate if the sentence is true or false.
 1. happy is man sick always a
 2. day it snow does every not

The use of testing

Definitions

Types of tests

Substantive domains

40

Exercise

- ▶ Imagine psychological dimensions that could be measured:
 - ▶ For candidates to a psychology graduate program
 - ▶ For candidate astronauts
 - ▶ For a client who seeks help after a job burnout

40