10.1 Psychometrics and test construction: evidence and transfer

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS standard error of measurement • construct validity

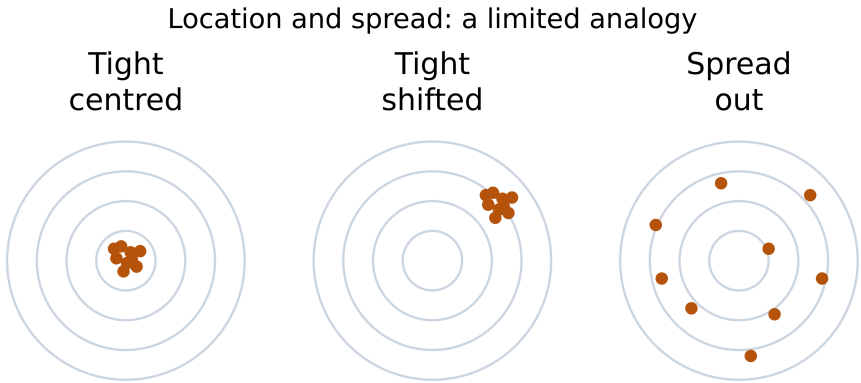
Objective

Distinguish reliability types by the design that produced them; Separate content, criterion and construct validity evidence; Compute standardised scores and the standard error of measurement. Original practice and authored marking guidance.

1 Key knowledge and worked examples

standard error of measurement : The expected spread of observed scores around the true score, SD×sqrt(1−r). **construct validity** : Convergent and discriminant evidence that a score reflects the intended trait.

Choose the reliability coefficient by the source of variation being studied. A standard error of measurement concerns measurement uncertainty under a model; it is not the standard error of a sample mean. The Spearman–Brown estimate assumes sufficiently comparable halves; a formula cannot repair unrelated item content. Standard scores describe relative position and do not show that a test measures the intended construct fairly across groups.



Worked case. A fictional scale has mean 50 points, SD 10 points and reliability .84. A score is 65. Compute z and SEM, showing the formulas.

z=(X−mean)/SD; z=(65 points −50 points)/(10 points)=1.5, dimensionless. SEM=SD√(1−r); SEM=(10 points)√(1−.84)=4 points. SEM is a model-based uncertainty measure, not proof of validity. T=50+10z; T=50+10(1.5)=65 on the T scale.

2 Practice

2.1 Odd and even halves of a test correlate r=.80. After Spearman-Brown correction, the estimated full-test reliability is about: [1]

A. 0.8 B. 0.85 C. 0.89 D. 0.91 E. 0.96

2.2 Evidence that a score tracks the intended trait rather than a different one is primarily: [1]

A. high test-retest reliability B. high internal consistency C. convergent and discriminant correlations D. a large normative sample E. high mean item difficulty

2.3 Revisit the worked case. State one conclusion its evidence supports and one stronger conclusion it does not support. Explain the difference. [2]

3 Exam-style questions

3.1 Two raters repeatedly disagree by five points but rank scripts identically. Does a high correlation establish agreement? Suggest a check. Give the interpretation, supporting reasoning, a relevant alternative or limitation, and an appropriate check. [4]

Solutions

2.1 Answer: C. r_full=2r/(1+r)=1.6/1.8≈.89. The other options do not satisfy the stated defining conditions.

2.2 Answer: C. Construct validity rests on convergent and discriminant evidence; the others are reliability or sampling properties. Compare the exact process, design or evidence, rather than an associated keyword.

2.3 Use the worked case evidence to support a bounded claim and explain why a causal, universal or stronger claim needs additional evidence. The claim must fit the specific design and observed process.

3.1 No. Rank association can remain perfect with systematic score differences. Inspect paired differences and an agreement measure suited to the use, with a clear rubric and rater training. Correlation alone does not establish interchangeable scores. Distinguish consistency from absolute agreement. Award B1 each (authored) for the interpretation, its reasoning, a relevant limitation/alternative and an appropriate check, up to four points. Accept a different justified answer satisfying these demands.