Reliability

LLE – Mathematics and Statistics Skills

1. A blood pressure machine is used to record patients' systolic blood pressure. A few minutes later a second reading is taken by the same machine. The results for 12 patients are shown

Patient	1	2	3	4	5	6	7	8	9	10	11	12
Reading 1	118	125	131	122	144	110	112	135	116	122	125	132
Reading 2	137	148	148	139	161	129	125	151	130	136	146	154

a Does the table suggest that this machine is working correctly?

Solution

You would expect the first and second reading to be similar for each patient, as they are only a few minutes apart. ICC for test-retest measures how similar the two readings are, not just how correlated they are (since it checks absolute agreement). Therefore, the machine doesn't appear to be working correctly.

b An intraclass correlation coefficient (ICC) is calculated to check test-retest absolute agreement. The coefficient value is 0.395. How would you interpret this value?

⊗ **Poor** ○ Acceptable ○ Good ○ Very good

Solution

ICC values of less than 0.5 indicate poor reliability. This matches the suspicions of the sample.

c A second machine is used and found to have an ICC = 0.993 for test-retest. Compare this machine to the first.

Solution

ICC values of greater than 0.9 indicate excellent reliability. This is a much better and more reliable machine than the first.

2. Trained health care workers assess the mobility of recovering road traffic accident patients using a new index. 5 healthcare workers all assess the same 25 patients using the scale. An intraclass correlation coefficient (ICC) is calculated to assess the inter-rater reliability of the scale and produces ICC = 0.76.

   (a) How would you rate the reliability of this index between different health care workers assessments?

   ○ Poor ○ Acceptable ⊗ **Good** ○ Very good ○ Excellent

   Solution

   ICC values between 0.7 and 0.8 indicate good reliability. This means that the 5 healthcare workers are in good agreement on the mobility of their patients.

3. To assess a patient's memory skills, the patient is graded on scale of 1 to 10 on 5 different assessments. From these 5 assessments a memory skill index is produced for the patient by summing the individual scores.

   (a) Name a coefficient that can be used to assess the internal consistency of the 5 assessments in measuring memory skill.

   Solution

   Internal consistency of scales can be measured using Cronbach's Alpha.

   (b) Given that the coefficient returns a value of 0.72, how would you assess the internal consistency of the 5 scales?

Solution

Cronbach Alpha values of over 0.7 are generally considered good internal consistency. It would be worth checking whether removing any of the 5 assessments improves the alpha value.

(c) If the 4th assessment in the scale is removed from the index calculation, the coefficient becomes 0.85. What would you conclude about this assessment?

Solution

The internal consistency of the scale has been improved by removing the 4th assessment. This suggests that the 4th assessment was not measuring the same latent variable (memory skill).