ORL 5524: Statistical illustration of the notion of “homogeneity” in domain sampling

Scale Score Evaluations and Reliability Analysis based on Domain Sampling Theory Assumptions

Data from Chatterji & Lin (2018) and from Chatterji (2003)

1. **SPSS Syntax [ANNOTATIONS IN RED AND CAPS]**

RELIABILITY

/VARIABLES=sc1 sc2 sc3 sc4 sc5 sc6 sc7 sc8 sc9 sc10 [VARIABLES=THESE ARE THE SELF CONCEPT ITEM NUMBERS]

/SCALE('Internal Consistency Reliability for Self-Concept Items') ALL sc10 [DEFINES THE SCALE BY ITEMS]

/MODEL=ALPHA [IDENTIFIES THE TYPE OF RELIABILITY YOU WISH TO EXAMINE. HERE, INTERNAL CONSISTENCY RELIABILITY WITH CRONBACH’S ALPHA]

/STATISTICS=DESCRIPTIVE SCALE CORR [ASKS FOR STATS YOU WANT TO LOOK AT OTHER THAN ALPHA ESTIMATE]

2. **SPSS Output**

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
student math self efficacy item22	11.3828	19.108	.633	.490	.818
student math self efficacy item23	11.3131	19.861	.546	.429	.827
student math self efficacy item24	10.9785	21.544	.384	.240	.840
student math self efficacy item25	11.1682	20.108	.589	.578	.823
student math self efficacy item26	11.4061	20.657	.419	.314	.839
student math self efficacy item27	11.0859	20.502	.542	.526	.828
student math self efficacy item28	11.3202	20.383	.464	.334	.834
student math self efficacy item29	11.3685	18.645	.702	.560	.811
student math self efficacy item30	11.5742	18.876	.597	.481	.822
student math self efficacy item31	12.0537	20.234	.499	.328	.831

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.842	.841	10

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum s_i^2}{s_x^2}\right)$$

$$\mathrm{KR}_{20} = \frac{k}{k-1}\left(1 - \frac{\sum pq}{\sigma_X^2}\right)$$

DEMONSTRATION 15.4

Calculating Cronbach's Alpha Coefficient

Item	Item Variance, s_i^2
1	8
2	5
3	10
4	7.2
5	12.5
	$\sum s_i^2 = 42.7$

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum s_i^2}{s_x^2}\right)$$

$s_X = 10.0$
$s_X^2 = 100.0$

$$\alpha = \frac{5}{4}\left(1 - \frac{42.7}{100}\right)$$

$$\alpha = \frac{5}{4}(.573)$$

$$\alpha = 1.25(.71)$$

$$\alpha = .72 \checkmark \checkmark$$

Note: The formula using population estimates appears as follows:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum \sigma_i^2}{\sigma_x^2}\right)$$