Psychometrics. Partial 2. January 2020. Type B / Type D

Case 1

20 items

$n = 60$

$\bar{x} = 5$

$S_x = 3$

$r_{ex} = 0'5$

$r^2_{ex} = 0'25$

$r_{xx'} = 1 - r^2_{ex} = 0'75$

$r_{xT} = \sqrt{r_{xx}} = 0'87$

1) $n = \frac{R_{xx}(1 - r_{xx})}{r_{xx}(1 - R_{xx})} = \frac{0'85\,(0'25)}{0'75\,(0'15)} = \frac{0'2125}{0'1125} = 1'89$

$n = \frac{EF}{EI} \Rightarrow 1'89 = \frac{EF}{20} \Rightarrow EF \simeq 38$

2) $S_2 = 3.2 = 6$ The answer can be known without calculations. Given that the original reliability coefficient is 0,75 and the new sample presents higher variability, the new reliability is going to be appropriate for sure.

$r_{22} = 1 - \frac{S_1^2}{S_2^2}(1 - r_{11})$

$r_{22} = 1 - \frac{9}{36}(1 - 0'75) = 1 - (0'25^2) = 0'94$

$0'94 > 0'7$ New r_{22} is appropriate.

3) Normal Distribution method.

$x = 10$

$\alpha = 0'01$

$Z_{0'01} = 2'58$

$Lim = x \pm \mathcal{E}max \Rightarrow 10 \pm 3'87 \begin{cases} 6'13 \\ 13'87 \end{cases}$

$\mathcal{E}max = Z_e . S_e = 2'58 . 1'5 = 3'87$

$S_e = S_x\sqrt{1 - r_{xx}} = 3.\sqrt{0'25} = 1'5$

The answer can be known without calculations (chosing the most accurate interval)

4) Regression Method.

$x = 10$

$\alpha = 0'01$

$Lim = T' \pm \mathcal{E}max = 8'75 \pm 3'37 \begin{cases} 5'38 \\ 12'12 \end{cases}$

$T' = r_{xx'}(x - \bar{x}) + \bar{x}$

$T' = 0'75(10 - 5) + 5 = 8'75$

$\mathcal{E}max = Z_e . S_{TX} = 2'58 . 1'305 = 3'37$

$S_{TX} = S_e . \sqrt{r_{xx}} = 1'5\sqrt{0'75} = 1'5 . 0'87 = 1'305$

Case 2

$\bar{X} = 8$ // $\bar{Y} = 4$ // $r^2_{xy} = 0'64$

$S_x = 1$ // $S^2_y = 4$ //

$S_y = 2$ $r_{xy} = \sqrt{0'64} = 0'8$

5) $A.C = \sqrt{1 - r^2_{xy}}$

$A.C = \sqrt{1 - 0'64} = \sqrt{0'36} = 0'6$

6) $S_{Y.X} = S_y\sqrt{1 - r^2_{xy}} = 2.\sqrt{1 - 0'64} = 2.\sqrt{0'36} = 1'2$

$S^2_{Y.X} = (1'2)^2 = 1'44$

7) $X = 4$

$Z_{y'} = r_{xy} Z_x = 0'8(-4) = -3'2$

$Z_x = \frac{x - \bar{x}}{S_x} = \frac{4 - 8}{1} = -4$ $r_{xy} = \sqrt{0'64} = 0'8$

8) $x=4$

$\alpha = 0'01$

$$Lim = y' \pm \mathcal{E}_{max} = -2'4 \pm 3'096 \begin{cases} +0'696 \\ -5'496 \end{cases}$$

$$y' = a + bx = -8'8 . 1'6\,(4) = -2'4$$

$$b = r_{xy}\frac{S_y}{S_x} = 0'8\,\frac{2}{1} = 1'6$$

$$a = \bar{y} - b\bar{x} = 4 - (1'6 . 8) = -8'8$$

$$\mathcal{E}_{max} = Z_c . S_{y.x}$$

$$\mathcal{E}_{max} = 2'58 . 1'2 = 3'096$$

Another way to obtain y'

$$Z_{\hat{y}} = \frac{y' - \bar{y}}{S_y} \Rightarrow$$

$$3'2 = \frac{y' - 4}{2} \Rightarrow y' = -2'4$$

AND ANOTHER:

$$y' = r_{xy} \cdot \frac{S_y}{S_x}(x - \bar{x}) + \bar{y} = 0.8\,\frac{2}{1}(4-8) + 4 =$$
$$1.6 \cdot (-4) + 4 = -6.4 + 4 = -2.4$$

Case 3

1	2	3	4	5	6	7	8	9	10	11	12
d	a	b	b	a	d	d	b	d	d	c	b

		test B Pass	test B Fail	
Test A	Pass	2 (a)	4 (b)	6 (g)
	Fail	1 (c)	5 (d)	6 (h)
		3 (e)	9 (f)	12 (N)

9) $P_o = \frac{F_c}{N} = \frac{7}{12} = 0'58$

$F_c = a + d$

10) $K = \frac{F_c - F_a}{N - F_a} = \frac{7-6}{12-6} = \frac{1}{6} \simeq 0'17 < 0'7$ Inappropriate

$$F_a = \frac{e.g}{N} + \frac{f.h}{N} = \frac{18}{12} + \frac{54}{12} = \frac{72}{12} = 6$$

Case 4

$\bar{x} = 8$

$S_x = 2$

$x = 8$

11) $T = 50 + 10Z_x \Rightarrow T = 50 + 0 = 50$

$$Z_x = \frac{x - \bar{x}}{S_x} = \frac{8-8}{2} = \emptyset$$

12) $y = a + bZ_x$

$$y = 20 + \cancel{3.(0)} = 20$$

13) $Z_x = \phi$ $\quad p = 0'5$ (obtained from z scores table)

$p = 50$

14)

$r_{xy} = 0'8$

$Z_x = \phi$

$Z_{\hat{y}} = r_{xy} \cdot Z_x \Rightarrow Z_{\hat{y}} = 0'8 \cdot (0) = \phi$

$E = 5 + 2 Z_n$

$E = 5 + \cancel{2(0)} = 5$

15)

$x = 8$

$\bar{x} = 6$

$S_x^2 = 9 \quad S_x = 3$

$\bar{y} = 10$

$S_y^2 = 4 \quad S_y = 2$

$x^* = y = \left(\frac{S_y}{S_x}\right) \cdot (x - \bar{x}) + \bar{y}$

$y = = \left(\frac{2}{3}\right) \cdot (8-6) + 10$

$y = (0'6 \cdot 2) + 10$

$y \simeq 11'33$