Errata Sheet for

Measurement Theory and Applications for the Social Sciences

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Note: Some of these errata have been fixed in later printings of the book.

Chapter 5

1. On page 88, in the first paragraph under the five example items, the third sentence should read "Dena would be given a score of 1.7 (using either the mean or median of the scale values), and Craig's score would be 8.4 (using the mean) or 8.5 (using the median)."

Chapter 6

1. On page 133, the second sentence in the paragraph under the first table should read "As can be seen from the frequency distribution, however, the reason for the low skewness value is that most respondents chose option 2, which is "neutral."

Chapter 7

1. On page 165, Box 7.1 should appear as below:

Box 7.1

Properties of Parallel, Tau-equivalent, Essentially Tau-equivalent, and Congeneric Measures

Type of Measure	μ_X	σ_X^2	σ_T^2	σ_E^2	$\sigma_{X_1 X_2}$	$\rho_{X_1 X_2}$	Relationship between True Scores
Parallel[a]	Must be equal	Must be equal	Must be Equal	Must be equal	Must be equal	Must be equal	$t_i = 0 + 1 * t_j$
Tau-Equivalent	Must be equal	May be equal or unequal	Must be Equal	May be equal or unequal	Must be equal	May be equal or unequal	$t_i = 0 + 1 * t_j$
Essentially Tau-equivalent[b]	May be equal or unequal	May be equal or unequal	Must be Equal	May be equal or unequal	Must be equal	May be equal or unequal	$t_i = a_{ij} + 1 * t_j$
Congeneric	May be equal or unequal	May be equal or unequal	May be equal or unequal	May be equal or unequal	May be equal or unequal	May be equal or unequal	$t_i = a_{ij} + b_{ij} * t_j$

[a] Also called *strictly parallel*

[b] Also called *true –score equivalent*

2. On page 166, in the paragraph beginning "Tau-equivalent measures", the text "(sometimes referred to as *true-score equivalent measures*)" should be deleted.
3. On page 166, in the paragraph beginning "Essentially tau-equivalent measures," should read "*Essentially tau-equivalent measures* (sometimes referred to as *true-score equivalent measures*)."

Chapter 8

1. On page 175, equations 8.9, 8.10, 8.11 should read (changing the quantity on the left-hand side from σ_{CC} to ρ_{CC}).

$$\rho_{CC'} = \frac{k^2 \sigma_{T_i}^2}{k \sigma_i^2 \left[1 + (k-1) \rho_{ii'} \right]}. \tag{8.9}$$

$$\rho_{CC'} = \frac{k^2 \rho_{ii'}}{k \left[1 + (k-1) \rho_{ii'} \right]} = \frac{k \rho_{ii'}}{1 + (k-1) \rho_{ii'}} \tag{8.10}$$

$$\rho_{CC'} = \frac{2 \rho_{ii'}}{1 + \rho_{ii'}} \tag{8.11}$$

2. On page 176, the same changes should be made to the two unnumbered equations at the top of the page:

$$\rho_{CC'} = \frac{3(.5)}{1 + (3-1).5} = \frac{1.5}{2} = .75.$$

$$\rho_{CC'} = \frac{.5(.8)}{1 + (.5-1).8} = \frac{.4}{1-.4} = \frac{.4}{.6} \cong .67.$$

3. On page 178, the sentence just before equation 8.14 should read " I therefore express the term to the left of the inequality as σ_T^2 and, substituting this expression into Equation 8.12, rewrite the original equation as"

Chapter 9

1. On page 214, a better wording for the third sentence before Table 9.3 is "This example shows that kappa will be lower when the prevalence of a positive event (in this case, a rating of "present") is very high. The same phenomenon would occur if the prevalence of a positive event were very low."
2. On page 214, the next-to-last sentence before Table 9.3 should read "As Sim and Wright point out, the effect of the prevalence level is greater for large than for small values of kappa."

Chapter 10

1. Tables 10.3, 10.4, and 10.7 contain incorrect values. The corrected tables are shown below.
   The text on page 234 that corresponds to Table 10.3 is also incorrect. The corrected text is shown below, with corrections highlighted in yellow.

Page 234, last two paragraphs should read:

The variance due to persons is by far the largest, at 55%. The person, or universe score variance is roughly analogous to true score variance in classical test theory. The relatively large amount of universe score variance indicates that nursing students varied systematically in their performance. The percentage of variance due to raters is quite small; only 4%. This indicates that the raters were quite consistent in their average ratings. The remaining variance is due to random measurement error and the interaction of persons by raters (remember that these are confounded). Person-rater interactions indicate that raters were more lenient for some students than others. However, we do not know from the error/interaction variance term whether random error or person/rater interaction accounts for most of this 41% of the variance in scores.

Another way to interpret variance components is to take the square root of each component. This provides a measure of the deviation of a score from the mean of that facet. For example, the rater variance component is .09, and its square root of .30 means that, on average, ratings vary about .30 of a point across raters. This is quite good given that ratings were made on a six-point scale.

Table 10.3 (corrected)

Estimated Variance Components for the One-facet, Crossed p x r Design

Source of variation	Mean Square (MS)	Estimated Variance Component	Percentage of Total Variance
Persons (*p*)	4.82	(4.83-.97)/3 = 1.28	55
Raters (*r*)	2.03	(2.03-.97)/12 = .09	4
Persons x raters, error (*pr,e*)	0.97	0.97	41
Total		2.34	100.00

Table 10.4 (corrected)

Estimated Variance Components for the Two-facet, Crossed p x r x t Design

Source of variation	Mean Square (MS)	Variance Component Equation	Estimated Variance Component	Percentage of Total Variance
Persons (p)	11.72	$\hat{\sigma}_p^2 = \dfrac{\left(MS_p - MS_{pr} - MS_{pt} + MS_{prt,e}\right)}{n_r n_t}$	$\dfrac{\left(11.72 - 2.06 - 1.00 + .64\right)}{3(3)} = 1.03$	44.2
Raters (r)	2.07	$\hat{\sigma}_r^2 = \dfrac{\left(MS_r - MS_{pr} - MS_{rt} + MS_{prt,e}\right)}{n_p n_t}$	$\dfrac{\left(2.07 - 2.06 - .79 + .64\right)}{12(3)} = -.004$	0
Tasks (t)	3.34	$\hat{\sigma}_t^2 = \dfrac{\left(MS_t - MS_{pt} - MS_{rt} + MS_{prt,e}\right)}{n_p n_r}$	$\dfrac{\left(3.34 - 1.00 - .79 + .64\right)}{12(3)} = 0.06$	2.6
pr	2.06	$\hat{\sigma}_{pr}^2 = \dfrac{\left(MS_{pr} - MS_{prt,e}\right)}{n_t}$	$\dfrac{\left(2.06 - .64\right)}{3} = 0.47$	20.2
pt	1.00	$\hat{\sigma}_{pt}^2 = \dfrac{\left(MS_{pt} - MS_{prt,e}\right)}{n_r}$	$\dfrac{\left(1.00 - .64\right)}{3} = 0.12$	5.1
rt	0.79	$\hat{\sigma}_{rt}^2 = \dfrac{\left(MS_{rt} - MS_{prt,e}\right)}{n_p}$	$\dfrac{\left(.79 - .64\right)}{12} = 0.01$	0.4
(prt,e)	0.64	$\hat{\sigma}_{prt,e}^2 = MS_{prt,e}$	0.64	27.5
Total			2.33	100

Table 10.7 (corrected)

Estimated Variance Components for the p x r x c Design with c Fixed

Random Design		Mixed Design with c Fixed		
Source of variation	Estimated Variance Component	Source of variation	Estimated Variance Component	Percentage of Total Variance
Persons (σ^2_p)	0.10	Persons (σ^2_{p*})	$\hat{\sigma}^2_{p*} = \hat{\sigma}^2_p + \dfrac{\hat{\sigma}^2_{pc}}{n_c} = .10 + \dfrac{.16}{2} = .18$	15.3
Raters (σ^2_r)	0.014	Raters (σ^2_{r*})	$\hat{\sigma}^2_{r*} = \hat{\sigma}^2_r + \dfrac{\hat{\sigma}^2_{rc}}{n_c} = .02 + \dfrac{0}{2} = .01$	1.2
Content area (σ^2_c)	0.33			
p x r (σ^2_{pr})	0.58	Error $(\sigma^2_{pr,e*})$	$\hat{\sigma}^2_{pr,e*} = \hat{\sigma}^2_{pr} + \dfrac{\hat{\sigma}^2_{prc,e}}{n_c} = .58 + \dfrac{.81}{2} = .99$	83.5
p x c (σ^2_{pc})	0.16			
r x c (σ^2_{rc})	-0.04[a]			
Error $(\sigma^2_{prc,e})$	0.81			
Total	1.99		1.18	100

[a] Negative variance estimate set to 0.

2. In table 10.9, the word "relative" was inadvertently included in the header of the last column as highlighted in yellow in the corrected table below. This word should be omitted.

3.

Table 10.9

Computation of Error Variances and Dependability Coefficients for Relative and Absolute Decisions

Source of variation	Estimated Variance Component	Variance Components included in Relative Error Variance	Variance Components included in ~~Relative~~ Absolute Error Variance
Persons (p)	1.55		
Raters (r)	0		X
Tasks (t)	0.06		X
pr	0.47	X	X
pt	0.12	X	X
rt	0.01		X
(prt,e)	0.64	X	X

$$\hat{\sigma}_{REL}^2 = \frac{\hat{\sigma}_{pr}^2}{n_r} + \frac{\hat{\sigma}_{pt}^2}{n_t} + \frac{\hat{\sigma}_{prt,e}^2}{n_r n_t} = \frac{.47}{3} + \frac{.12}{3} + \frac{.64}{3(3)} = .16 + .04 + .71 = .91$$

$$\hat{\sigma}_{ABS}^2 = \frac{\hat{\sigma}_{r}^2}{n_r} + \frac{\hat{\sigma}_{t}^2}{n_t} + \frac{\hat{\sigma}_{pr}^2}{n_r} + \frac{\hat{\sigma}_{pt}^2}{n_t} + \frac{\hat{\sigma}_{rt}^2}{n_r n_t} + \frac{\hat{\sigma}_{prt,e}^2}{n_r n_t} = \frac{0}{3} + \frac{.06}{3} + \frac{.47}{3} + \frac{.12}{3} + \frac{.01}{9} + \frac{.64}{3(3)}$$

$$= 0 + .02 + .16 + .04 + .001 + .71 = .931$$

Note: X indicates the variance component is not included in the error variance.

Chapter 11

1. On page 259, first full paragraph, the third sentence should read "As it turned out, however, they need not have worried as others were more than willing to do so for them." (the word "do" is missing in the original).

Chapter 12

1. On page 306, first paragraph, the third sentence from the end of the paragraph should read "This means we can navigate between X_1 and X_4… by going backward along path a, through path g, and moseying forward along path d, thus allowing X_1 and X_4 to be correlated."
2. On page 308, equation 12.1, the v subscript is missing from U term. The equation should read:

$$X_{iv} = w_{v1}F_{1i} + w_{v2}F_{2i} + ... + w_{vf}F_{fi} + U_{iv} \qquad (12.1)$$

3. On page 310, first paragraph, the fourth and fifth sentences should read "I can also go through paths a, g, and l. The correlation of X_1 and X_2 would therefore be equal to $a * b$ plus $a * g * l$."
4. On page 310, the next-to-last sentence in the first paragraph should read:

   "As another illustration, the pathways between X_3 and X_5 are $c * i$ and $c * g * e$, and their correlation should be equal to $c * i + c * g * e$. As a final example, to get from X_1 to X_4, I can go through a, then g, and then d, and I can also go through a and then h. The correlation between X_1 and X_4 should therefore be equal to $a * h + a * g * d$."

5. On page 313, second paragraph, the sixth and seventh sentences should refer to the squared factor loadings rather than the factor loadings. That is, the two sentences should read:
   "Recall that the squared factor loadings are measures of the amount of variance…." and "Thus, each squared factor loading represents the variance shared…"
6. On page 332, first paragraph under "Simple Structure," the fifth sentence should read "The values of paths a and d might be estimated as .6 each, and the value of path g as .55."

Chapter 13

1. On page 366, first full paragraph, the first sentence should read "…Taking the model in Figure 13.2 as an example, we see that each of the four factors has three variables loading on it…"
2. On page 393, Box 13.2 should appear as follows:

Box 13.2

Properties of Parallel, Tau-equivalent, Essentially Tau-equivalent, and Congeneric Measures

Type of Measure	μ_X	σ_X^2	σ_T^2	σ_E^2	$\sigma_{X_1 X_2}$	$\rho_{X_1 X_2}$	Relationship between True Scores
Parallel[a]	Must be equal	Must be equal	Must be Equal	Must be equal	Must be equal	Must be equal	$t_i = 0 + 1 * t_j$
Tau-Equivalent	Must be equal	May be equal or unequal	Must be Equal	May be equal or unequal	Must be equal	May be equal or unequal	$t_i = 0 + 1 * t_j$
Essentially Tau-equivalent[b]	May be equal or unequal	May be equal or unequal	Must be Equal	May be equal or unequal	Must be equal	May be equal or unequal	$t_i = a_{ij} + 1 * t_j$
Congeneric	May be equal or unequal	May be equal or unequal	May be equal or unequal	May be equal or unequal	May be equal or unequal	May be equal or unequal	$t_i = a_{ij} + b_{ij} * t_j$

[a] Also called *strictly parallel*

[b] Also called *true –score equivalent*

Chapter 14

1. On page 416, a_i should be removed from the left-hand side of Equation 14.6 as shown below:

$$P(x_{ij} = k | \theta_j, b_{ik}) = \frac{e^{\sum_{x=0}^{k}(\theta - b_{ik})}}{\sum_{j=0}^{m_i} e^{\sum_{x=0}^{j}(\theta - b_{ik})}}$$

2. Corresponding to the change in Equation 14.6, the text below the equation should read "…, given particular values of θ and b."

Chapter 16

1. On page 484, second paragraph under "Mantel-Haenszel Statistic," the third and fourth sentences should read "In terms of the entries in Table 16.1, the odds for the reference group could be written as $(a/b)/N_T$. For the focal group, the odds would be $(c/d)/N_T$.

2. On page 489, first full paragraph, the first sentence, should read "Based on the ETS system, the example item would be classified as level A because $|\Delta_{MH}|$ is $|-.89|$ or 0.89, which is less than one,…"

3. In Table 16.6 on page 511, second paragraph of the second column adjacent to "Griggs v. Duke," the sentence should read "…In addition, there was evidence of disparate impact because White employees were promoted in disproportionate numbers to Black employees."

Chapter 18

1. On page 558 under equation 18.11, fifth sentence should read "This has the effects of making the mean and SD of the new test form (X) in group 1 equal to the synthetic mean and SD for this test."
2. On page 569, first paragraph, the end of the last sentence should read "… by assuming a sample size of 100 and multiplying the proportion of examinees who obtained each x or y score by 100."
3. On page 575, the last sentence (numbered 1) should read "1. Find the theta value for each score on X…"