Errata

Items with asterisks will still be in the Second Printing

Author website URL: http://cehs.unl.edu/EdPsych/RJSite/home.

*P7. “The square root of $\sigma_k^2$ (i.e., $\sigma_k$) is referred to…” not “The square root of $\sigma_k^2$ (i.e., $\sigma_k$) is referred to…”

*P28. “A narrow interval indicates comparatively less uncertainty about a …” not “A narrow interval indicates comparatively less certainty about a …”

*P28. There are two equations listed as 2.11. The second 2.11 equation should be labeled 2.12.

*P28. Equation 2.13 should be $(1-\alpha)\%CB: \hat{\theta} \pm z_{(1-\alpha/2)}\sigma_e(\hat{\theta})$

P64. To summarize our analyses, the nonlinear factor analysis provided support that a unidimensional model of the data is a reasonable representation [ ] the data. [of] is missing

P73. Equation 4.11. $p \rightarrow p_j$ & $\pi_{ij} = \sum^N_j p_j(X_i | x_j, \theta, \nu)$

P79. Table 4.1. $PSD(\hat{\theta}) = \frac{0.0624150}{0.1174369} = 0.7290 \rightarrow PSD(\hat{\theta}) = \sqrt{\frac{0.0624150}{0.1174369}} = 0.7290$

*P86. Line 1: Should read: A(X1) = 0.7648E-04 = 0.00007648

*P86. Line 17: “$\alpha_j\sqrt{1+\alpha_j^2}$” should be $\alpha_j/\sqrt{1+\alpha_j^2}$

*P90. Line 6: IFNAME='C:\MATHRSCH.dat' should be IFNAME='C:\MATHRSCH.PAR'

P92. (just below Equation 4.17). $\xi^*$ is the $\delta^*_j$ (or $\theta$) is the $\delta$, on the target metric $\rightarrow$ $\xi^*$ is the $\delta^*_j$ (or $\theta^*$) is the target metric.

*P93. Equation 4.21 should read $\kappa = \delta^* - \zeta \vec{\delta}$

P100. (just above Figure 5.1). $p(x = 1 | \theta, \alpha_j, \delta_j) \rightarrow p(x_j = 1 | \theta, \alpha_j, \delta_j)$
\[ P_{j} = \alpha_{j} \frac{e^{\alpha_{j}(\theta - \delta_{j})}}{(1 + e^{\alpha_{j}(\theta - \delta_{j})})(1 + e^{\alpha_{j}(\theta - \delta_{j})})} = \alpha_{j} \left[ \frac{e^{\alpha_{j}(\theta - \delta_{j})}}{[1 + e^{\alpha_{j}(\theta - \delta_{j})}]^2} \right] \]

\[ R_{\Delta}^2 = \frac{110774.295 - 110397.103}{110774.295} = 0.003 \quad \Rightarrow \quad R_{\Delta}^2 = \frac{110397.103 - 110064.929}{110397.103} = 0.003 \]

Equation 6.8. There is no closing parenthesis or the opening parenthesis may need to be removed.

Equation 6.21 → Equation 6.22

\[ \frac{e^{(\theta - \delta_{2})}}{\theta} \rightarrow \frac{e^{(\theta - \delta_{2})}}{\varphi} \]

Figure 7.1:
- Panel a: \( e^{0} \)
- Panel b: \( e^{0+(\theta - \delta_{1})} \)
- Panel c: \( e^{0+(\theta - \delta_{2}) + (\theta - \delta_{1})} \)

Therefore, Figure 7.1 should appear as:

\[ \begin{array}{ccc}
  x_j = 0 & x_j = 1 & x_j = 2 \\
  \delta_1 & \delta_2 & \theta \\
\end{array} \]

(a) \[ e^{0} \]

(b) \[ e^{0} + (\theta - \delta_{1}) \]

(c) \[ e^{0} + (\theta - \delta_{1}) + (\theta - \delta_{2}) \]

*P120. Equation 5.15.

*P141. The last line. Equation 6.21 → Equation 6.22

*P143. Second paragraph, last sentence should read “The probability of both of these is given by adding the (mutually exclusive) events of 0 and 1, that is, \( e^{0+(\theta - \delta_{1})} \).

*P145. Third paragraph, fourth and fifth sentences should read “Therefore, to obtain an \( x_j = 2 \) the individual passes through \( x_j = 0 \) (i.e., \( e^{0} \)), passes through \( x_j = 1 \) (i.e., \( e^{0+(\theta - \delta_{1})} \)), and then passes through the second transition point (i.e., \( e^{0+(\theta - \delta_{1})+(\theta - \delta_{2})} \)). Therefore, the probability of \( x_j = 2 \) is given by \( e^{0+(\theta - \delta_{1})+(\theta - \delta_{2})} \).

*P155. Fourth paragraph, first sentence should read “When each of the three terms (i.e., \( x_j = 0: e^{0}, x_j = 1: e^{0+(\theta - \delta_{1})}, x_j = 2: e^{0+(\theta - \delta_{1})+(\theta - \delta_{2})} \) is ...”

*P165. Figure 7.1:
**P171.** Table 7.1 'NEXAMINEES=3000' should be 'NEXAMINEES=2942'

**P177.** The last paragraph. There is no A, B, and C in Figure 7.7. Figure 7.7A, Figure 7.7B, and Figure 7.7C correspond to the top, middle, and bottom graphs, respectively.

**P197.** 12th line from the bottom. 1.3 logit → 2.1 logit (-90 – 1.26 = - 2.16). 4th line from the bottom. “strongly agree” → ”strongly disagree”

**P199.** 10th line from the top. 22 respondents. → 45 respondents (180 people/4 categories=45)

**P210.** First full paragraph, first sentence: “… an item $\delta_{jk}$ s …” should be “… an item $\delta_{jh}$ s …” and in the last sentence of this paragraph “… substituting $\delta_{jh} = \delta_j - \tau_k$ …” should be “… substituting $\delta_{jh} = \delta_j - \tau_h$ …”

**P212.** Figure 8.2 $\alpha_s$ should be $\alpha_2$.

**P225.** 14th line from the top. the approximate range of -1.57 to 1.23 → the approximate range of -1.88 to 1.23 (item 6’s $\tilde{\delta}_{j1} = -1.88$)

**P231.** Equation 8.8 should be:  
$$I_{x_j}(\theta) = \frac{\left\{ P_{x_j} \right\}^2}{P_{x_j}} = \frac{\left[ P_{x_j}^{*} - P_{x_{j+1}}^{*} \right]^2}{P_{x_j}^{*} - P_{x_{j+1}}^{*}}$$  

**P231.** The first equation after “so that” in the bottom half of this page should be:  
$$p_0' = [P_0' - P_1'] = 0 - \alpha_j \left( \frac{e^{\sigma_j(\theta-\delta_1)}}{\varphi_1} \right) = - \alpha_j \left( \frac{e^{\sigma_j(\theta-\delta_1)}}{\varphi_1} \right)$$

**P232.** The first equation should be:  
$$p_i' = [P_i' - P_2'] = \alpha_j \left( \frac{e^{\sigma_j(\theta-\delta_1)}}{\varphi_1} \right) - \alpha_j \left( \frac{e^{\sigma_j(\theta-\delta_2)}}{\varphi_2} \right) = \alpha_j \left[ \frac{e^{\sigma_j(\theta-\delta_1)}}{\varphi_1} - \frac{e^{\sigma_j(\theta-\delta_2)}}{\varphi_2} \right]$$

**P234.** Equation 8.10.  $x_k$ → $x_{jk}$
**P250.** The clause after the semicolon should read:
"in this case the corresponding HIGH category identification does not need to be changed (i.e., HIGH=(2,3,4,3))."

**P251.** Last line of the paragraph that continues from p. 250: “..; we use the 2lnL value below.” should read “..; we use the -2lnL value below.”

**P266.** First full paragraph, line 5: “.. the difference chi-square is 288.4 - 259.73 = 29.1” should read “.. the difference chi-square is 288.4-259.3 = 29.1”

**P266.** Second to last sentence in the first full paragraph: “With a critical $X^2$ of …” should be “With a critical $\chi^2$ of …” (i.e., chi square is not italicized)

**P268.** Item 4’s ORFs for the theta range -10 to 10 (left panel) and -100 to 100 (right panel)

![Graph](image)

**P279.** 9th line from the bottom. According to Figure 10.3, the rightmost line is related to $p_j = 0.95$ instead of $p_j = 0.90$

**P294.** $\gamma^*_j = \gamma_j \frac{\alpha_j(\kappa)}{\zeta} \rightarrow \gamma^*_j = \gamma_j - \frac{\alpha_j(\kappa)}{\zeta}$

**P296.** Table 10.1’s Note should read “Name=intrprsnl.inp”

Last updated 10/10/15
**P313.** Equation 11.6 should read $\kappa = \delta^* - \zeta \delta$

**P320.** Table 11.3: The initial value of the K should be 0.20 not 0.10. Therefore,

\[
\text{INITIAL VALUE FOR A=} \quad 0.8000 \quad \text{INITIAL VALUE FOR K=} \quad 0.1000
\]

should be

\[
\text{INITIAL VALUE FOR A=} \quad 0.8000 \quad \text{INITIAL VALUE FOR K=} \quad 0.2000
\]

**P331.** The TSW $\Delta G^2$ DIF approach can be performed using either MULTILOG or IRTLRDIF (Thissen, D. (2001). *IRTLRDIF v2.0b: Software for the computation of the statistics involved in item response theory likelihood-ratio tests for differential item functioning* [Computer software and manual]. Chapel Hill: L.L. Thurstone Psychometric Laboratory, University of North Carolina.)

**P338.** The $\Delta G^2$ should read 41.407 not 44.407.

**P338.** The estimated full model should be:

\[
z_3 = -1.3330 + 0.1371 * X + 0.7714 * RACE - 0.1171 (X * RACE)
\]

**P338.** The estimated reduced model (1) should be:

\[
z_3 = 0.5558 + 0.0481 * X - 1.9577 * RACE
\]

**P339.** Table 12.4 should read:

```plaintext
/* Full Model */

The LOGISTIC Procedure

Model Fit Statistics

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Intercept Only</th>
<th>Intercept and Covariates</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIC</td>
<td>2568.331</td>
<td>2225.517</td>
</tr>
<tr>
<td>SC</td>
<td>2573.947</td>
<td>2247.980</td>
</tr>
<tr>
<td>-2 Log L</td>
<td>2566.331</td>
<td>2217.517</td>
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</table>

Testing Global Null Hypothesis: BETA=0

<table>
<thead>
<tr>
<th>Test</th>
<th>Chi-Square</th>
<th>DF</th>
<th>Pr &gt; ChiSq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood Ratio</td>
<td>348.8144</td>
<td>3</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Score</td>
<td>302.5715</td>
<td>3</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Wald</td>
<td>238.7854</td>
<td>3</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>
```

Last updated 10/10/15
The LOGISTIC Procedure
Analysis of Maximum Likelihood Estimates

Parameter DF Estimate    Error    Chi-Square Pr > ChiSq
Intercept  1   -1.3330     0.3626       13.5133    0.0002
X          1    0.1371     0.0086     5.3560     0.0207
RACE       1    0.7714     0.4484       2.9596    0.0854
X*RACE     1   -0.1171     0.0193      36.9106    <.0001

/* reduce model (1)/"full" model */

Model Fit Statistics

Criterion        Intercept Only Covariates
AIC            2568.331       2264.923
SC             2573.947       2281.771
-2 Log L       2566.331
                2258.923

Testing Global Null Hypothesis: BETA=0

Test               Chi-Square   DF   Pr > ChiSq
Likelihood Ratio   307.4075    2  <.0001
Score              292.7168    2  <.0001
Wald               262.7802    2  <.0001

Analysis of Maximum Likelihood Estimates

Parameter DF Estimate    Error    Chi-Square Pr > ChiSq
Intercept  1    0.5558     0.1880       8.7427    0.0031
X          1    0.0481     0.0074     41.2621    <.0001
RACE       1   -1.9577     0.1211      261.3266   <.0001

Odds Ratio Estimates

Effect Estimate    Confidence Limits
X            1.049   1.034       1.065
RACE        0.141   0.111       0.179

*P340. The second to the last sentence in the paragraph should read: “Given our coding of the
RACE variable if \( \hat{\tau}_2 < 0 \), then the item favors the focal group. In contrast, if \( \hat{\tau}_2 > 0 \) then the item
favors the reference group.”

*P340. Table 12.5 should read:

/* reduce model (2) */

Model Fit Statistics

Criterion        Intercept Only Covariates
AIC            2568.331       2569.709
SC             2573.947       2580.941
-2 Log L       2566.331
                2565.709

Last updated 10/10/15
Testing Global Null Hypothesis: BETA=0

<table>
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<th>Chi-Square</th>
<th>DF</th>
<th>Pr &gt; ChiSq</th>
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<tbody>
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<td>Likelihood Ratio</td>
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<td>1</td>
<td>0.4304</td>
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<tr>
<td>Score</td>
<td>0.6223</td>
<td>1</td>
<td>0.4302</td>
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<tr>
<td>Wald</td>
<td>0.6221</td>
<td>1</td>
<td>0.4303</td>
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</table>

Analysis of Maximum Likelihood Estimates

<table>
<thead>
<tr>
<th>Parameter</th>
<th>DF</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>Chi-Square</th>
<th>Pr &gt; ChiSq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1</td>
<td>0.8521</td>
<td>0.1727</td>
<td>24.3530</td>
<td>&lt;.0001</td>
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<tr>
<td>X</td>
<td>1</td>
<td>-0.00488</td>
<td>0.00619</td>
<td>0.6221</td>
<td>0.4303</td>
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</tbody>
</table>

Odds Ratio Estimates

<table>
<thead>
<tr>
<th>Effect</th>
<th>Point Estimate</th>
<th>95% Wald Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>0.995</td>
<td>0.983 to 1.007</td>
</tr>
</tbody>
</table>

*P345. Endnote 6. Reduced model (1): should be

\[ z_3 = 0.5558 + 0.0481* X - 1.9577* RACE \]

and the corresponding text should read:

“Therefore, holding the observed score fixed and switching from the focal group to the reference group results in a decrease in the log odds of obtaining a response of 1 by 1.9577. In terms of odds we have that the odds that a reference group member will produce a response of 1 are \( \exp(-1.9577) = 0.1412 \) to 1 (note: 0.141 is the value listed as the Point Estimate in the Odds Ratio Estimates section). Alternatively, holding the observed score fixed, one expects the odds of focal group members to correctly respond to the item to be roughly 7 to 1 (i.e., \( 1/0.1412 = 7.0830 \)) relative to comparable reference group members.”

P356. 16th line from the top. if \( q_j = 0 \), then \( \delta = \infty \), and if \( q_j = N \), then \( \delta = -\infty \)

P357. First Equation: negative sign in front of \( q_j \):

\[ \frac{\partial}{\partial \delta} \ln L(\mathbf{\delta}) = -q_j + \sum_{i=1}^{N} p_{ij}^{(t)} \]

P358. B.4’s subscripts are not formatted properly. It should appear as:

\[ \sigma^2(\hat{\delta}) = \frac{1}{\sqrt{\sum_{X=1}^{n} n_x p_{Xj}^* (1-p_{Xj})}} \]
If we take our total sample of individuals and divide it into subgroups and we redefine the standard deviation in Equation C.33 to be the standard deviation of a subgroup, $\sigma_i$, with mean $\mu_i$, then its substitution into Equation C.2 gives Thurstone's mental age model; we're assuming that each subgroup is normally distributed. That is, Thurstone (1925; e.g., see p. 441) developed a model based on the cumulative normal distribution to determine the proportion of individuals of a specified age group correctly responding to an item.

Equation E.24. $\chi^2_{SC} \rightarrow \chi^2_{SC} =$