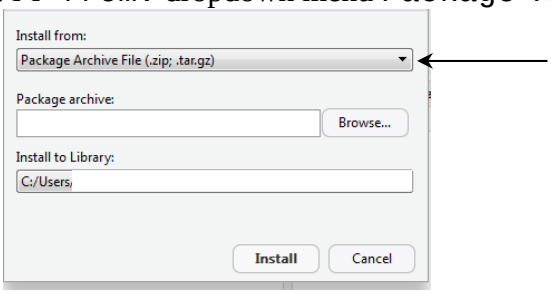
Errata (second edition)

Author website URL: https://cehs.unl.edu/edpsych/rj-site/

Note: Results from a 32-bit PC may differ from those obtained on a 64-bit PC.

Chapter 3.

`mixRasch` is available from the `R` archive,
To access it just link to `tar.gz` file at https://cran.r-project.org/src/contrib/Archive/mixRasch/ then `install.packages("insert-path-to-tar.gz-file", repos = NULL)`
Alternatively from within RStudio simply use the `Install Packages` tool and select from `Install from:` dropdown menu `Package Archive File (.zip;. tar.gz)`:



The last step is to load `library(mixRasch)`

Alternative packages that use JMLE are `rasch.jml` from the `sirt` package or `tam.jml` from the `TAM` package.

P393. Equation 10.3 should read

$$p(x_{ij}=1|\underline{\boldsymbol{\theta}}_i,\underline{\boldsymbol{\alpha}}_j,\gamma_j)=\frac{e^{\sum\alpha_{jf}\delta_{jf}+\gamma_j}}{1+e^{\sum\alpha_{jf}\delta_{jf}+\gamma_j}}=\frac{e^{\underline{\boldsymbol{\alpha}}'_j\underline{\boldsymbol{\theta}}_i+\gamma_j}}{1+e^{\underline{\boldsymbol{\alpha}}'_j\underline{\boldsymbol{\theta}}_i+\gamma_j}}$$

P404. Equation 10.15 should read

$$p(x_{ij}=1|\underline{\boldsymbol{\theta}}_i,\underline{\boldsymbol{\alpha}}'_j,\gamma_j,\chi_j)=\chi_j+(1-\chi_j)\frac{e^{\underline{\boldsymbol{\alpha}}'_j\underline{\boldsymbol{\theta}}_i+\gamma_j}}{1+e^{\underline{\boldsymbol{\alpha}}'_j\underline{\boldsymbol{\theta}}_i+\gamma_j}}$$

P423. Table 10.4. Executing `mirt` in exploratory mode produces results that match flexMIRT and NOHARM output. (Thanks to Harsha Perera)

One-dimension

```
> print((TwoPL=mirt(intprnsndat,model=1,itemtype='2PL',method='MHRM',SE=T)))
   Stage 3 = 58, LL = -6466.6, AR(2.03) = [0.41], gam = 0.0086, Max-Change = 0.0007

   Calculating information matrix...
```

```
   Calculating log-likelihood...

   Call:
   mirt(data = intprnsndat, model = 1, itemtype = "2PL", SE = T,
       method = "MHRM")

   Full-information item factor analysis with 1 factor(s).
   Converged within 0.001 tolerance after 58 MHRM iterations.
   mirt version: 1.36.1
   M-step optimizer: NR1
   Latent density type: Gaussian
   Average MH acceptance ratio(s): 0.407

   Information matrix estimated with method: MHRM
   Second-order test: model is a possible local maximum
   Condition number of information matrix =  10.42931

   Log-likelihood = -5708.632, SE = 0.021
   Estimated parameters: 20
   AIC = 11457.26
   BIC = 11555.42; SABIC = 11491.9
   G2 (1003) = 737.98, p = 1
   RMSEA = 0, CFI = NaN, TLI = NaN

> coef(TwoPL,simplify=T)
   $items
          a1      d g u
   i1  1.991  1.432 0 1
   i2  1.076  0.295 0 1
   i3  1.280  0.625 0 1
   i4  1.072  0.553 0 1
   i5  0.813  0.059 0 1
   i6  1.493 -1.356 0 1
   i7  1.269 -0.801 0 1
   i8  1.092 -0.995 0 1
   i9  1.237 -1.586 0 1
   i10 1.174 -1.732 0 1

   $means
   F1
    0

   $cov
      F1
   F1  1
```

Two-dimensions

```
> print((M2PL2D =mirt(intprnsndat,2,'2PL',method='MHRM',SE=T)))
   Stage 3 = 84, LL = -7762.6, AR(0.93) = [0.42], gam = 0.0065, Max-Change = 0.0005

   Calculating information matrix...

   Calculating log-likelihood...

   Call:
   mirt(data = intprnsndat, model = 2, itemtype = "2PL", SE = T,
       method = "MHRM")

   Full-information item factor analysis with 2 factor(s).
   Converged within 0.001 tolerance after 84 MHRM iterations.
```

```
    mirt version: 1.36.1
    M-step optimizer: NR1
    Latent density type: Gaussian
    Average MH acceptance ratio(s): 0.405

    Information matrix estimated with method: MHRM
    Second-order test: model is not a maximum or the information matrix is too
    inaccurate

    Log-likelihood = -5692.494, SE = 0.021
    Estimated parameters: 29
    AIC = 11442.99
    BIC = 11585.31; SABIC = 11493.21
    G2 (994) = 705.6, p = 1
    RMSEA = 0, CFI = NaN, TLI = NaN

> coef(M2PL2D,simplify=T)
    $items
            a1     a2      d g u
    i1  -2.344 -1.072  1.662 0 1
    i2  -1.074 -0.539  0.290 0 1
    i3  -1.268 -0.548  0.626 0 1
    i4  -1.088  0.068  0.543 0 1
    i5  -0.785 -0.230  0.047 0 1
    i6  -1.521  0.210 -1.396 0 1
    i7  -1.389  0.452 -0.869 0 1
    i8  -1.148  0.342 -1.042 0 1
    i9  -1.370  0.562 -1.726 0 1
    i10 -1.138  0.000 -1.731 0 1

    $means
    F1 F2
     0  0

    $cov
       F1 F2
    F1  1  0
    F2  0  1
```

Three-dimensions

```
> print((M2PL3D =mirt(intprnsndat,3,'2PL',method='MHRM',SE=T)))
    Stage 3 = 94, LL = -9051.0, AR(0.63) = [0.41], gam = 0.0059, Max-Change = 0.0008

    Calculating information matrix...

    Calculating log-likelihood...

    Call:
    mirt(data = intprnsndat, model = 3, itemtype = "2PL", SE = T,
        method = "MHRM")

    Full-information item factor analysis with 3 factor(s).
    Converged within 0.001 tolerance after 94 MHRM iterations.
    mirt version: 1.36.1
    M-step optimizer: NR1
    Latent density type: Gaussian
    Average MH acceptance ratio(s): 0.403

    Information matrix estimated with method: MHRM
```

```
   Second-order test: model is not a maximum or the information matrix is too
   inaccurate

   Log-likelihood = -5689.093, SE = 0.021
   Estimated parameters: 37
   AIC = 11452.19
   BIC = 11633.77; SABIC = 11516.26
   G2 (986) = 698.78, p = 1
   RMSEA = 0, CFI = NaN, TLI = NaN

> coef(M2PL3D,simplify=T)
   $items
          a1     a2     a3      d g u
   i1  -2.177 -0.978 -0.581  1.631 0 1
   i2  -1.146 -0.549 -0.001  0.312 0 1
   i3  -1.312 -0.548 -0.052  0.652 0 1
   i4  -1.086 -0.081  0.063  0.555 0 1
   i5  -0.779 -0.305 -0.834  0.058 0 1
   i6  -1.488  0.213 -0.297 -1.376 0 1
   i7  -1.487  0.733 -0.629 -0.941 0 1
   i8  -1.187  0.390 -0.038 -1.044 0 1
   i9  -1.392  0.554  0.000 -1.716 0 1
   i10 -1.191  0.000  0.000 -1.742 0 1

   $means
   F1 F2 F3
    0  0  0

   $cov
      F1 F2 F3
   F1  1  0  0
   F2  0  1  0
   F3  0  0  1
```

Model comparisons

```
> anova(TwoPL,M2PL2D)
   Model 1: mirt(data = intprnsndat, model = 1, itemtype = "2PL", SE = T,
       method = "MHRM")
   Model 2: mirt(data = intprnsndat, model = 2, itemtype = "2PL", SE = T,
       method = "MHRM")

         AIC    SABIC       HQ      BIC    logLik     X2  df   p
   1 11457.26 11491.90 11494.57 11555.42 -5708.632    NaN NaN NaN
   2 11442.99 11493.21 11497.08 11585.31 -5692.494 32.276   9   0

> anova(M2PL2D,M2PL3D)
   Model 1: mirt(data = intprnsndat, model = 2, itemtype = "2PL", SE = T,
       method = "MHRM")
   Model 2: mirt(data = intprnsndat, model = 3, itemtype = "2PL", SE = T,
       method = "MHRM")

         AIC    SABIC       HQ      BIC    logLik    X2  df     p
   1 11442.99 11493.21 11497.08 11585.31 -5692.494   NaN NaN   NaN
   2 11452.18 11516.26 11521.20 11633.77 -5689.093 6.803   8 0.558
```