Multiple Group CFA Invariance Example (data from Brown Chapter 7) using MLR in M*plus* 8.4:
Major Depression Criteria across Men and Women (*n* = 345 each)

9 items rated by clinicians on a scale of 0 to 8 (0 = none, 8 = very severely disturbing/disabling)

1. Depressed mood
2. Loss of interest in usual activities
3. Weight/appetite change
4. Sleep disturbance
5. Psychomotor agitation/retardation
6. Fatigue/loss of energy
7. Feelings of worthless/guilt
8. Concentration difficulties
9. Thoughts of death/suicidality

Note: Mplus v. 7 and up offers a simplified set of syntax commands to assess invariance. However, I will teach you the manual version so that you learn what you are doing first (then you can take their shortcuts on your own).

Mplus Code to Read in Data:

```
TITLE:      CFA Multiple Group Invariance
DATA:       FILE = Example7a.csv;          ! Don't need path if in same directory
            FORMAT = FREE;                 ! Default
            TYPE = INDIVIDUAL;             ! Default

VARIABLE:   NAMES = PersonID sex item1-item9;     ! Every variable in DATA SET
            USEVARIABLES = item1-item9;           ! Every variable in MODEL only
            GROUPING = sex (0=Women 1=Men);       ! Identify grouping variable
            MISSING = ALL (99999);                ! Identify missing values
            IDVARIABLE = PersonID;                ! Identify person ID variable

ANALYSIS:   ESTIMATOR = MLR;        ! For continuous items whose residuals may not be normal

OUTPUT:     MODINDICES(3.84);       ! Voodoo to improve model (list if p<.05 for DF=1)
            STDYX;                  ! Requests fully standardized solution (not shown here)
            RESIDUAL;               ! Requests normalized residuals for local fit (not shown here)


MODEL:      (model syntax goes here, to be changed for each model)
```

In each case, the model for the women reference group is the same—what changes <u>is how the men (alt group) are allowed to differ</u>. There are two ways to constrain parameters across groups. One is to leave it off the men alternative group, and the other is to use labeled constraints: ( ) after the parameter. We will use the latter because it is more general. Note that if the groups have different items, you will need to use a general MODEL and then separate group-specific MODELs as well (see Mplus manual for examples).

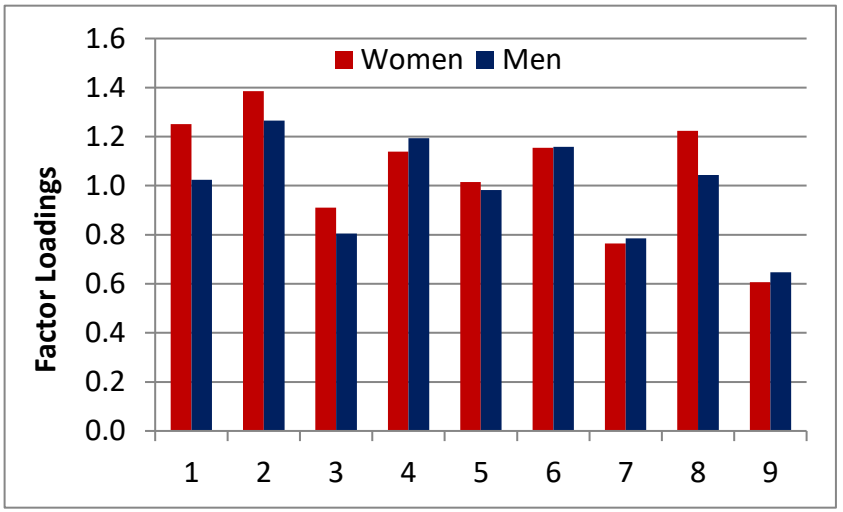
Model 1. Configural Invariance Model (Everything separate across groups)

```
! WOMEN REFERENCE GROUP: CONFIGURAL MODEL

MODEL:
! Factor loadings all freely estimated, just labeled
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all freely estimated, just labeled
  [item1-item9*] (I1-I9);
! Residual variances all freely estimated, just labeled
  item1-item9* (E1-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2* (ECOV12);
! Factor variance fixed to 1 for identification
  DEPRESS@1;
! Factor mean fixed to 0 for identification (Mplus forces)
  [DEPRESS@0];
```

```
! MEN ALTERNATIVE GROUP: 1 CONFIGURAL MODEL

MODEL Men:
! Factor loadings all freely estimated, not labeled
  DEPRESS BY item1-item9*;
! Item intercepts all freely estimated, not labeled
  [item1-item9*];
! Residual variances all freely estimated, not labeled
  item1-item9*;
! Residual covariance (free for 1&2)
  item1 WITH item2*;
! Factor variance fixed to 1 for identification
  DEPRESS@1;
! Factor mean fixed to 0 for identification
  [DEPRESS@0];
```

```
Number of Free Parameters                       56

Loglikelihood
          H0 Value                       -13706.898
          H0 Scaling Correction Factor        0.9808
            for MLR

          H1 Value                       -13657.442
          H1 Scaling Correction Factor        1.0143
            for MLR

Information Criteria
          Akaike (AIC)                    27525.796
          Bayesian (BIC)                  27784.520
          Sample-Size Adjusted BIC        27606.698
            (n* = (n + 2) / 24)

Chi-Square Test of Model Fit
          Value                              94.175*
          Degrees of Freedom                    52
          P-Value                            0.0003
          Scaling Correction Factor          1.0503
            for MLR

Chi-Square Contributions From Each Group
          W                                  50.418
          M                                  43.756
```

```
RMSEA (Root Mean Square Error Of Approximation)
          Estimate                           0.047
          90 Percent C.I.                    0.031  0.061
          Probability RMSEA <= .05           0.632

CFI/TLI
          CFI                                0.963
          TLI                                0.949
```



UNSTANDARDIZED MODEL RESULTS – NOTE ALL PARAMETERS (EXCEPT MARKER LOADING AND FACTOR MEANS) DIFFER ACROSS GROUPS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group Women				
DEPRESS BY (FACTOR LOADINGS)				
ITEM1	1.251	0.095	13.156	0.000
ITEM2	1.385	0.103	13.427	0.000
ITEM3	0.911	0.104	8.775	0.000
ITEM4	1.139	0.115	9.873	0.000
ITEM5	1.015	0.106	9.613	0.000
ITEM6	1.155	0.103	11.238	0.000
ITEM7	0.764	0.115	6.621	0.000
ITEM8	1.224	0.113	10.817	0.000
ITEM9	0.606	0.094	6.413	0.000
ITEM1 WITH **(RESIDUAL COVARIANCE)**				
ITEM2	0.393	0.166	2.362	0.018
Means (FACTOR MEAN FIXED=0 FOR IDENTIFICATION)				
DEPRESS	0.000	0.000	999.000	999.000
Intercepts (ITEM MEANS PER GROUP IN THIS SCALING)				
ITEM1	4.184	0.089	47.258	0.000
ITEM2	3.725	0.104	35.848	0.000
ITEM3	1.952	0.108	18.058	0.000
ITEM4	3.589	0.114	31.458	0.000
ITEM5	2.256	0.110	20.522	0.000
ITEM6	3.955	0.103	38.237	0.000
ITEM7	3.869	0.106	36.382	0.000
ITEM8	3.595	0.111	32.331	0.000
ITEM9	1.205	0.092	13.053	0.000
Variances (FACTOR VARIANCE FIXED=1 FOR IDENTIFICATION)				
DEPRESS	1.000	0.000	999.000	999.000
Residual Variances (ITEM ERROR VARIANCES)				
ITEM1	1.375	0.194	7.089	0.000
ITEM2	2.132	0.236	9.048	0.000
ITEM3	3.551	0.201	17.679	0.000
ITEM4	3.584	0.272	13.166	0.000
ITEM5	3.501	0.223	15.734	0.000
ITEM6	2.677	0.269	9.967	0.000
ITEM7	3.658	0.276	13.271	0.000
ITEM8	3.137	0.291	10.785	0.000
ITEM9	2.831	0.195	14.539	0.000

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group Men				
DEPRESS BY				
ITEM1	1.024	0.099	10.384	0.000
ITEM2	1.266	0.112	11.283	0.000
ITEM3	0.805	0.115	7.011	0.000
ITEM4	1.193	0.123	9.729	0.000
ITEM5	0.982	0.113	8.678	0.000
ITEM6	1.159	0.116	10.010	0.000
ITEM7	0.785	0.131	5.995	0.000
ITEM8	1.043	0.121	8.610	0.000
ITEM9	0.647	0.102	6.359	0.000
ITEM1 WITH				
ITEM2	0.920	0.205	4.499	0.000
Means (FACTOR MEAN FIXED=0 FOR IDENTIFICATION)				
DEPRESS	0.000	0.000	999.000	999.000
Intercepts				
ITEM1	4.171	0.082	50.608	0.000
ITEM2	3.685	0.104	35.414	0.000
ITEM3	1.739	0.108	16.098	0.000
ITEM4	3.357	0.115	29.160	0.000
ITEM5	2.235	0.109	20.560	0.000
ITEM6	3.661	0.109	33.598	0.000
ITEM7	3.421	0.118	29.014	0.000
ITEM8	3.517	0.112	31.372	0.000
ITEM9	1.259	0.092	13.649	0.000
Variances (FACTOR VARIANCE FIXED=1 FOR IDENTIFICATION)				
DEPRESS	1.000	0.000	999.000	999.000
Residual Variances				
ITEM1	1.499	0.216	6.932	0.000
ITEM2	2.459	0.274	8.989	0.000
ITEM3	3.727	0.205	18.167	0.000
ITEM4	3.547	0.291	12.189	0.000
ITEM5	3.467	0.236	14.717	0.000
ITEM6	3.111	0.296	10.521	0.000
ITEM7	4.599	0.279	16.457	0.000
ITEM8	3.626	0.296	12.267	0.000
ITEM9	2.770	0.208	13.291	0.000

Model 2. Metric Invariance Model (loadings held equal across groups)

```
! WOMEN REFERENCE GROUP: CONFIGURAL MODEL
MODEL:
! Factor loadings all freely estimated, just labeled
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all freely estimated, just labeled
  [item1-item9*] (I1-I9);
! Residual variances all freely estimated, just labeled
  item1-item9* (E1-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2* (ECOV12);
! Factor variance fixed to 1 for identification
  DEPRESS@1;
! Factor mean fixed to 0 for identification
  [DEPRESS@0];
```

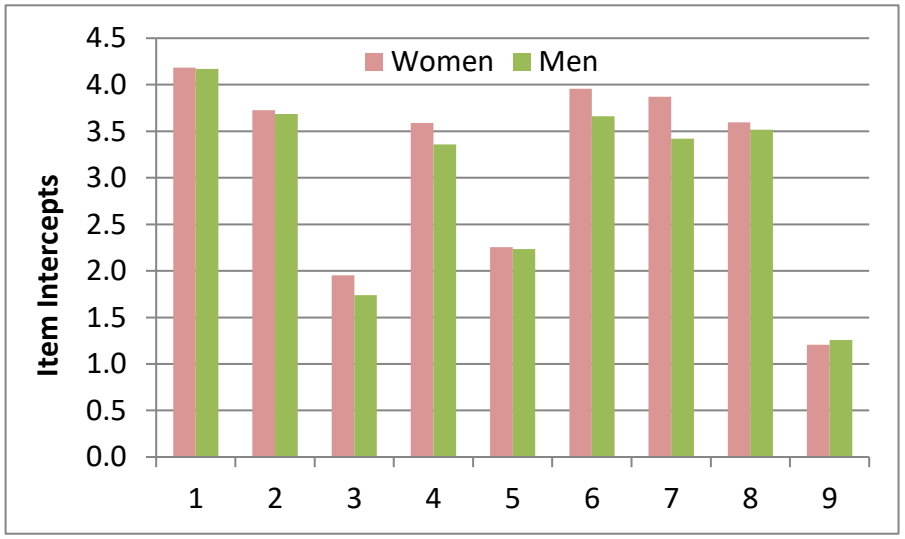
```
! MEN ALTERNATIVE GROUP: 2 METRIC MODEL
MODEL Men:
! Factor loadings NOW labeled to be constrained to women's
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all freely estimated, not labeled
  [item1-item9*];
! Residual variances all freely estimated, not labeled
  item1-item9*;
! Residual covariance (free for 1&2)
  item1 WITH item2*;
! Factor variance CAN NOW BE FREELY ESTIMATED
  DEPRESS*;
! Factor mean fixed to 0 for identification
  [DEPRESS@0];
```

```
Number of Free Parameters                       48
Loglikelihood
          H0 Value                       -13708.862
          H0 Scaling Correction Factor        0.9906
            for MLR
          H1 Value                       -13657.442
          H1 Scaling Correction Factor        1.0143
            for MLR

Information Criteria
          Akaike (AIC)                    27513.724
          Bayesian (BIC)                  27735.488
          Sample-Size Adjusted BIC        27583.069
            (n* = (n + 2) / 24)
```

Did model fit get significantly worse than configural? Nope.
$-2\Delta LL(df=8) = 4.26$, $p = .83$

```
Chi-Square Test of Model Fit
          Value                             99.532*
          Degrees of Freedom                   60
          P-Value                           0.0010
          Scaling Correction Factor         1.0332
            for MLR
Chi-Square Contributions From Each Group
          W                                 52.985
          M                                 46.547
```

```
RMSEA (Root Mean Square Error Of Approximation)
          Estimate                           0.042
          90 Percent C.I.                    0.027  0.056
          Probability RMSEA <= .05           0.814

CFI/TLI
          CFI                                0.966
          TLI                                0.959
```



UNSTANDARDIZED MODEL RESULTS – NOTE NOW FACTOR LOADINGS ARE HELD EQUAL (but standardized loadings won't be yet)

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group Women				
DEPRESS BY				
ITEM1	1.180	0.082	14.455	0.000
ITEM2	1.386	0.088	15.667	0.000
ITEM3	0.888	0.084	10.542	0.000
ITEM4	1.202	0.091	13.153	0.000
ITEM5	1.035	0.084	12.301	0.000
ITEM6	1.191	0.084	14.198	0.000
ITEM7	0.792	0.092	8.642	0.000
ITEM8	1.186	0.094	12.595	0.000
ITEM9	0.647	0.073	8.813	0.000
ITEM1 WITH				
ITEM2	0.439	0.158	2.777	0.005
Means (FACTOR MEAN FIXED=0 FOR IDENTIFICATION)				
DEPRESS	0.000	0.000	999.000	999.000
Intercepts				
ITEM1	4.184	0.089	47.258	0.000
ITEM2	3.725	0.104	35.848	0.000
ITEM3	1.952	0.108	18.058	0.000
ITEM4	3.589	0.114	31.458	0.000
ITEM5	2.256	0.110	20.522	0.000
ITEM6	3.955	0.103	38.237	0.000
ITEM7	3.869	0.106	36.382	0.000
ITEM8	3.595	0.111	32.331	0.000
ITEM9	1.205	0.092	13.053	0.000
Variances (FACTOR VARIANCE FIXED=1 FOR IDENTIFICATION)				
DEPRESS	1.000	0.000	999.000	999.000
Residual Variances				
ITEM1	1.444	0.189	7.646	0.000
ITEM2	2.151	0.220	9.794	0.000
ITEM3	3.556	0.190	18.738	0.000
ITEM4	3.540	0.261	13.543	0.000
ITEM5	3.479	0.206	16.850	0.000
ITEM6	2.648	0.261	10.140	0.000
ITEM7	3.656	0.271	13.482	0.000
ITEM8	3.153	0.275	11.465	0.000
ITEM9	2.827	0.195	14.492	0.000

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group Men				
DEPRESS BY				
ITEM1	1.180	0.082	14.455	0.000
ITEM2	1.386	0.088	15.667	0.000
ITEM3	0.888	0.084	10.542	0.000
ITEM4	1.202	0.091	13.153	0.000
ITEM5	1.035	0.084	12.301	0.000
ITEM6	1.191	0.084	14.198	0.000
ITEM7	0.792	0.092	8.642	0.000
ITEM8	1.186	0.094	12.595	0.000
ITEM9	0.647	0.073	8.813	0.000
ITEM1 WITH				
ITEM2	0.862	0.187	4.610	0.000
Means (FACTOR MEAN FIXED=0 FOR IDENTIFICATION)				
DEPRESS	0.000	0.000	999.000	999.000
Intercepts				
ITEM1	4.171	0.082	50.608	0.000
ITEM2	3.685	0.104	35.414	0.000
ITEM3	1.739	0.108	16.098	0.000
ITEM4	3.357	0.115	29.160	0.000
ITEM5	2.235	0.109	20.560	0.000
ITEM6	3.661	0.109	33.598	0.000
ITEM7	3.421	0.118	29.014	0.000
ITEM8	3.517	0.112	31.372	0.000
ITEM9	1.259	0.092	13.649	0.000
Variances (FACTOR VARIANCE CAN NOW BE ESTIMATED)				
DEPRESS	0.863	0.112	7.728	0.000
Residual Variances				
ITEM1	1.436	0.203	7.060	0.000
ITEM2	2.412	0.245	9.854	0.000
ITEM3	3.731	0.196	19.064	0.000
ITEM4	3.617	0.258	14.027	0.000
ITEM5	3.488	0.216	16.176	0.000
ITEM6	3.161	0.270	11.688	0.000
ITEM7	4.619	0.260	17.798	0.000
ITEM8	3.587	0.276	12.998	0.000
ITEM9	2.781	0.208	13.395	0.000

Modification indices do not suggest that freeing any loadings between groups would help, so we proceed with loadings fully invariant.

Model 3A (i.e., foreshadowing with the letter A). Scalar Invariance Model (all loadings and intercepts held equal across groups)

```
! WOMEN REFERENCE GROUP: CONFIGURAL MODEL
MODEL:
! Factor loadings all freely estimated, just labeled
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all freely estimated, just labeled
  [item1-item9*] (I1-I9);
! Residual variances all freely estimated, just labeled
  item1-item9* (E1-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2* (ECOV12);
! Factor variance fixed to 1 for identification
  DEPRESS@1;
! Factor mean fixed to 0 for identification
  [DEPRESS@0];
```

```
! MEN ALTERNATIVE GROUP: 3A SCALAR MODEL
MODEL Men:
! Factor loadings now labeled to be constrained to women's
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts now labeled to be constrained to women's
  [item1-item9*] (I1-I9);
! Residual variances all freely estimated, not labeled
  item1-item9*;
! Residual covariance (free for 1&2)
  item1 WITH item2*;
! Factor variance CAN STILL BE FREELY ESTIMATED
  DEPRESS*;
! Factor mean CAN NOW BE FREELY ESTIMATED
  [DEPRESS*];
```

```
Number of Free Parameters                       40
Loglikelihood
          H0 Value                       -13715.097
          H0 Scaling Correction Factor        0.9875
            for MLR

          H1 Value                       -13657.442
          H1 Scaling Correction Factor        1.0143
            for MLR

Information Criteria
          Akaike (AIC)                    27510.194
          Bayesian (BIC)                  27694.997
          Sample-Size Adjusted BIC        27567.981
            (n* = (n + 2) / 24)
```

Did model fit get significantly worse than metric? Nope.
$-2\Delta LL(df=8) = 12.39$, $p = .13$
However…

```
Chi-Square Test of Model Fit
          Value                            111.950*
          Degrees of Freedom                   68
          P-Value                          0.0006
          Scaling Correction Factor        1.0300
            for MLR

Chi-Square Contributions From Each Group
          W                                58.945
          M                                53.006
```

```
RMSEA (Root Mean Square Error Of Approximation)
          Estimate                         0.042
          90 Percent C.I.                  0.027  0.055
          Probability RMSEA <= .05         0.842

CFI/TLI
          CFI                              0.962
          TLI                              0.959
```

Although the overall test of scalar invariance holds, modification indices suggest that freeing the intercept for item 7 between groups would help significantly

```
MODEL MODIFICATION INDICES
Minimum M.I. value for printing the modification index     3.840

                          M.I.     E.P.C.  Std E.P.C.  StdYX
E.P.C.
Group Women
Means/Intercepts/Thresholds
[ ITEM7    ]             5.897     0.158      0.158      0.076

Group Men
Means/Intercepts/Thresholds
[ ITEM7    ]             5.894    -0.219     -0.219     -0.096
```

So old Intercept 7: 3.711
New Women Intercept 7: 3.869 (≈3.711 + 0.158)
New Men Intercept 7: 3.493 (≈3.711 + −0.219)

UNSTANDARDIZED MODEL RESULTS – NOTE NOW FACTOR LOADINGS AND INTERCEPTS ARE HELD EQUAL

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group Women				
DEPRESS BY				
ITEM1	1.171	0.081	14.385	0.000
ITEM2	1.377	0.089	15.534	0.000
ITEM3	0.894	0.084	10.622	0.000
ITEM4	1.209	0.091	13.344	0.000
ITEM5	1.033	0.084	12.276	0.000
ITEM6	1.199	0.083	14.424	0.000
ITEM7	0.803	0.091	8.853	0.000
ITEM8	1.184	0.094	12.534	0.000
ITEM9	0.640	0.074	8.604	0.000
ITEM1 WITH				
ITEM2	0.454	0.159	2.852	0.004
Means (FACTOR MEAN FIXED=0 FOR IDENTIFICATION)				
DEPRESS	0.000	0.000	999.000	999.000
Intercepts				
ITEM1	4.240	0.077	54.986	0.000
ITEM2	3.773	0.092	41.112	0.000
ITEM3	1.897	0.087	21.735	0.000
ITEM4	3.541	0.096	37.066	0.000
ITEM5	2.303	0.090	25.622	0.000
ITEM6	3.882	0.091	42.556	0.000
ITEM7	3.711	0.087	42.428	0.000
ITEM8	3.620	0.094	38.567	0.000
ITEM9	1.268	0.072	17.592	0.000
Variances (FACTOR VARIANCE FIXED=1 FOR IDENTIFICATION)				
DEPRESS	1.000	0.000	999.000	999.000
Residual Variances				
ITEM1	1.460	0.193	7.576	0.000
ITEM2	2.166	0.223	9.726	0.000
ITEM3	3.555	0.191	18.619	0.000
ITEM4	3.535	0.261	13.520	0.000
ITEM5	3.478	0.206	16.880	0.000
ITEM6	2.648	0.260	10.183	0.000
ITEM7	3.683	0.268	13.767	0.000
ITEM8	3.155	0.277	11.376	0.000
ITEM9	2.834	0.192	14.790	0.000

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group Men				
DEPRESS BY				
ITEM1	1.171	0.081	14.385	0.000
ITEM2	1.377	0.089	15.534	0.000
ITEM3	0.894	0.084	10.622	0.000
ITEM4	1.209	0.091	13.344	0.000
ITEM5	1.033	0.084	12.276	0.000
ITEM6	1.199	0.083	14.424	0.000
ITEM7	0.803	0.091	8.853	0.000
ITEM8	1.184	0.094	12.534	0.000
ITEM9	0.640	0.074	8.604	0.000
ITEM1 WITH				
ITEM2	0.879	0.185	4.754	0.000
Means (NOW ESTIMATED TO REPRESENT DIFFERENCE IN FACTOR MEANS)				
DEPRESS	-0.112	0.083	-1.345	0.179
Intercepts				
ITEM1	4.240	0.077	54.986	0.000
ITEM2	3.773	0.092	41.112	0.000
ITEM3	1.897	0.087	21.735	0.000
ITEM4	3.541	0.096	37.066	0.000
ITEM5	2.303	0.090	25.622	0.000
ITEM6	3.882	0.091	42.556	0.000
ITEM7	3.711	0.087	42.428	0.000
ITEM8	3.620	0.094	38.567	0.000
ITEM9	1.268	0.072	17.592	0.000
Variances (FACTOR VARIANCE CAN STILL BE ESTIMATED)				
DEPRESS	0.864	0.112	7.720	0.000
Residual Variances				
ITEM1	1.451	0.200	7.258	0.000
ITEM2	2.431	0.240	10.124	0.000
ITEM3	3.730	0.196	19.058	0.000
ITEM4	3.611	0.258	13.975	0.000
ITEM5	3.489	0.216	16.165	0.000
ITEM6	3.161	0.276	11.468	0.000
ITEM7	4.657	0.277	16.832	0.000
ITEM8	3.588	0.274	13.119	0.000
ITEM9	2.788	0.213	13.105	0.000

Model 3B. *Partial* Scalar Invariance Model (all loadings and intercepts held equal across groups EXCEPT INTERCEPT FOR ITEM 7)

```
! WOMEN REFERENCE GROUP: CONFIGURAL MODEL
MODEL:
! Factor loadings all freely estimated, just labeled
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all freely estimated, just labeled
  [item1-item9*] (I1-I9);
! Residual variances all freely estimated, just labeled
  item1-item9* (E1-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2* (ECOV12);
! Factor variance fixed to 1 for identification
  DEPRESS@1;
! Factor mean fixed to 0 for identification
  [DEPRESS@0];
```

```
! MEN ALTERNATIVE GROUP: 3B SCALAR MODEL
MODEL Men:
! Factor loadings now labeled to be constrained to women's
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all constrained to women's, but not 7
  [item1-item9*] (I1-I6 I7m I8-I9);
! Residual variances all freely estimated, not labeled
  item1-item9*;
! Residual covariance (free for 1&2)
  item1 WITH item2*;
! Factor variance CAN STILL BE FREELY ESTIMATED
  DEPRESS*;
! Factor mean CAN STILL BE FREELY ESTIMATED
  [DEPRESS*];
```

```
Number of Free Parameters                       41

Loglikelihood
          H0 Value                       -13712.050
          H0 Scaling Correction Factor        0.9885
            for MLR
          H1 Value                       -13657.442
          H1 Scaling Correction Factor        1.0143
            for MLR

Information Criteria
          Akaike (AIC)                    27506.100
          Bayesian (BIC)                  27695.523
          Sample-Size Adjusted BIC        27565.332
            (n* = (n + 2) / 24)
```

Did model fit get significantly better than full scalar? Yep.
−2ΔLL(df=**1**) = 5.93, *p* = .01

Did model fit get significantly worse than metric? Nope.
−2ΔLL(df=**7**) = 6.36, *p* = .50

```
Chi-Square Test of Model Fit
          Value                            106.031*
          Degrees of Freedom                   67
          P-Value                          0.0017
          Scaling Correction Factor        1.0300
            for MLR
```

```
Chi-Square Contributions From Each Group
          W                                  56.211
          M                                  49.820

RMSEA (Root Mean Square Error Of Approximation)
          Estimate                            0.039
          90 Percent C.I.                     0.024  0.053
          Probability RMSEA <= .05            0.892
CFI/TLI
          CFI                                 0.966
          TLI                                 0.963
```

Relevant new output:

```
                                                    Two-Tailed
                   Estimate       S.E.  Est./S.E.    P-Value
Group Women

 Means (FACTOR MEAN FIXED=0 FOR IDENTIFICATION)
    DEPRESS            0.000      0.000    999.000    999.000

  Intercepts
    M7                 3.869      0.106     36.382      0.000

Group Men

  Means (NOW FREE TO REPRESENT SMALLER DIFFERENCE IN FACTOR
MEANS)
    DEPRESS           -0.090      0.083     -1.087      0.277

 Intercepts
    M7                 3.493      0.123     28.376      0.000
```

Model 4. Residual Variance Invariance Model (error variances held equal for all except item 7 because it didn't pass scalar)

```
! WOMEN REFERENCE GROUP: CONFIGURAL MODEL
MODEL:
! Factor loadings all freely estimated, just labeled
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all freely estimated, just labeled
  [item1-item9*] (I1-I9);
! Residual variances all freely estimated, just labeled
  item1-item9* (E1-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2* (ECOV12);
! Factor variance fixed to 1 for identification
  DEPRESS@1;
! Factor mean fixed to 0 for identification
  [DEPRESS@0];
```

```
! MEN ALTERNATIVE GROUP: 4 RESIDUAL VARIANCE MODEL
MODEL Men:
! Factor loadings now labeled to be constrained to
women's
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all constrained to women's, but not 7
  [item1-item9*] (I1-I6 I7m I8-I9);
! Residual variances constrained to women's, but not 7
  item1-item9* (E1-E6 E7m E8-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2*;
! Factor variance CAN STILL BE FREELY ESTIMATED
  DEPRESS*;
! Factor mean CAN STILL BE FREELY ESTIMATED
  [DEPRESS*];
```

```
Number of Free Parameters                       33
Loglikelihood
          H0 Value                       -13714.472
          H0 Scaling Correction Factor        1.0053
            for MLR

          H1 Value                       -13657.442
          H1 Scaling Correction Factor        1.0143
            for MLR

Information Criteria
          Akaike (AIC)                    27494.944
          Bayesian (BIC)                  27647.406
          Sample-Size Adjusted BIC        27542.618
            (n* = (n + 2) / 24)
```

Did model fit get significantly worse than partial scalar B? Nope.
$-2\Delta LL(df=8) = 5.27$, $p = .73$

```
Chi-Square Test of Model Fit
          Value                            112.019*
          Degrees of Freedom                    75
          P-Value                           0.0036
          Scaling Correction Factor         1.0182
            for MLR

Chi-Square Contributions From Each Group
          W                                 59.668
          M                                 52.350

RMSEA (Root Mean Square Error Of Approximation)
          Estimate                           0.036
          90 Percent C.I.                    0.021  0.050
          Probability RMSEA <= .05           0.954

CFI/TLI
          CFI                                0.968
          TLI                                0.969
```

UNSTANDARDIZED MODEL RESULTS – NOTE NOW FACTOR LOADINGS, INTERCEPTS (except 7), AND RESIDUAL VARIANCES (except 7) ARE HELD EQUAL

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group WOMEN				
DEPRESS BY				
ITEM1	1.167	0.082	14.180	0.000
ITEM2	1.372	0.089	15.357	0.000
ITEM3	0.888	0.083	10.656	0.000
ITEM4	1.203	0.090	13.342	0.000
ITEM5	1.031	0.084	12.316	0.000
ITEM6	1.197	0.083	14.494	0.000
ITEM7	0.787	0.092	8.594	0.000
ITEM8	1.178	0.093	12.608	0.000
ITEM9	0.639	0.074	8.601	0.000
ITEM1 WITH (EQUAL TO RESIDUAL CORRELATION=.266)				
ITEM2	0.485	0.160	3.034	0.002
Means (FACTOR MEAN FIXED=0 FOR IDENTIFICATION)				
DEPRESS	0.000	0.000	999.000	999.000
Intercepts				
ITEM1	4.228	0.078	53.945	0.000
ITEM2	3.763	0.093	40.534	0.000
ITEM3	1.886	0.087	21.609	0.000
ITEM4	3.528	0.096	36.879	0.000
ITEM5	2.292	0.090	25.454	0.000
ITEM6	3.862	0.091	42.537	0.000
ITEM7	**3.869**	**0.106**	**36.382**	**0.000**
ITEM8	3.609	0.094	38.325	0.000
ITEM9	1.261	0.071	17.668	0.000
Variances (FACTOR VARIANCE FIXED=1 FOR IDENTIFICATION)				
DEPRESS	1.000	0.000	999.000	999.000
Residual Variances				
ITEM1	1.448	0.145	9.955	0.000
ITEM2	2.301	0.177	12.966	0.000
ITEM3	3.646	0.143	25.449	0.000
ITEM4	3.574	0.197	18.123	0.000
ITEM5	3.479	0.161	21.647	0.000
ITEM6	2.903	0.199	14.558	0.000
ITEM7	**3.653**	**0.271**	**13.463**	**0.000**
ITEM8	3.367	0.207	16.292	0.000
ITEM9	2.809	0.143	19.650	0.000

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group MEN				
DEPRESS BY				
ITEM1	1.167	0.082	14.180	0.000
ITEM2	1.372	0.089	15.357	0.000
ITEM3	0.888	0.083	10.656	0.000
ITEM4	1.203	0.090	13.342	0.000
ITEM5	1.031	0.084	12.316	0.000
ITEM6	1.197	0.083	14.494	0.000
ITEM7	0.787	0.092	8.594	0.000
ITEM8	1.178	0.093	12.608	0.000
ITEM9	0.639	0.074	8.601	0.000
ITEM1 WITH (EQUAL TO RESIDUAL CORRELATION=.456)				
ITEM2	0.833	0.151	5.500	0.000
Means (FREELY ESTIMATED TO BE FACTOR MEAN DIFFERENCE)				
DEPRESS	-0.091	0.084	-1.083	0.279
Intercepts				
ITEM1	4.228	0.078	53.945	0.000
ITEM2	3.763	0.093	40.534	0.000
ITEM3	1.886	0.087	21.609	0.000
ITEM4	3.528	0.096	36.879	0.000
ITEM5	2.292	0.090	25.454	0.000
ITEM6	3.862	0.091	42.537	0.000
ITEM7	**3.493**	**0.123**	**28.380**	**0.000**
ITEM8	3.609	0.094	38.325	0.000
ITEM9	1.261	0.071	17.668	0.000
Variances (FREELY ESTIMATED)				
DEPRESS	0.882	0.111	7.937	0.000
Residual Variances				
ITEM1	1.448	0.145	9.955	0.000
ITEM2	2.301	0.177	12.966	0.000
ITEM3	3.646	0.143	25.449	0.000
ITEM4	3.574	0.197	18.123	0.000
ITEM5	3.479	0.161	21.647	0.000
ITEM6	2.903	0.199	14.558	0.000
ITEM7	**4.629**	**0.260**	**17.814**	**0.000**
ITEM8	3.367	0.207	16.292	0.000
ITEM9	2.809	0.143	19.650	0.000

Modification indices do not suggest that freeing any other residual variances between groups would help, so we proceed with them fully invariant.

Model 5. Residual Covariance Invariance Model (error covariance for items 1–2 now held equal)

```
! WOMEN REFERENCE GROUP: CONFIGURAL MODEL
MODEL:
! Factor loadings all freely estimated, just labeled
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all freely estimated, just labeled
  [item1-item9*] (I1-I9);
! Residual variances all freely estimated, just labeled
  item1-item9* (E1-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2* (ECOV12);
! Factor variance fixed to 1 for identification
  DEPRESS@1;
! Factor mean fixed to 0 for identification
  [DEPRESS@0];
```

```
! MEN ALTERNATIVE GROUP: 5 RESIDUAL COVARIANCE MODEL
MODEL Men:
! Factor loadings now labeled to be constrained to women's
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all constrained to women's, but not 7
  [item1-item9*] (I1-I6 I7m I8-I9);
! Residual variances constrained to women's, but not 7
  item1-item9* (E1-E6 E7m E8-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2 (ECOV12)*;
! Factor variance CAN STILL BE FREELY ESTIMATED
  DEPRESS*;
! Factor mean CAN STILL BE FREELY ESTIMATED
  [DEPRESS*];
```

```
Number of Free Parameters                       32
Loglikelihood
          H0 Value                       -13719.118
          H0 Scaling Correction Factor        0.9672
            for MLR

          H1 Value                       -13657.442
          H1 Scaling Correction Factor        1.0143
            for MLR

Information Criteria
          Akaike (AIC)                    27502.235
          Bayesian (BIC)                  27650.078
          Sample-Size Adjusted BIC        27548.465
            (n* = (n + 2) / 24)
```

Did model fit get significantly worse than residual variance?
$-2\Delta LL(df=1) = 4.18$, $p = .04$ **Yes, so we leave the residual covariance between items 1 and 2 separate by group.**

```
Chi-Square Test of Model Fit
          Value                            119.281*
          Degrees of Freedom                   76
          P-Value                           0.0011
          Scaling Correction Factor         1.0341
            for MLR

Chi-Square Contributions From Each Group
          W                                 62.953
          M                                 56.328

RMSEA (Root Mean Square Error Of Approximation)
          Estimate                           0.039
          90 Percent C.I.                    0.025  0.052
          Probability RMSEA <= .05           0.916

CFI/TLI
          CFI                                0.962
          TLI                                0.964
```

		Estimate	S.E.	Est./S.E.	Two-Tailed P-Value	
M1	WITH					
M2		0.671	0.132	5.075	0.000	→ constrained residual covariance estimate (correlation=.366)

STRUCTURAL INVARIANCE TESTS
Model 6. Factor Variance Invariance Model

```
! WOMEN REFERENCE GROUP: CONFIGURAL MODEL
MODEL:
! Factor loadings all freely estimated, just labeled
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all freely estimated, just labeled
  [item1-item9*] (I1-I9);
! Residual variances all freely estimated, just labeled
  item1-item9* (E1-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2* (ECOV12);
! Factor variance fixed to 1 for identification
  DEPRESS@1;
! Factor mean fixed to 0 for identification
  [DEPRESS@0];
```

```
! MEN ALTERNATIVE GROUP: 6 FACTOR VARIANCE MODEL
MODEL Men:
! Factor loadings now labeled to be constrained to women's
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all constrained to women's, but not 7
  [item1-item9*] (I1-I6 I7m I8-I9);
! Residual variances constrained to women's, but not 7
  item1-item9* (E1-E6 E7m E8-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2*;
! Factor variance NOW CONSTRAINED EQUAL TO WOMEN'S
  DEPRESS@1;
! Factor mean CAN STILL BE FREELY ESTIMATED
  [DEPRESS*];
```

```
Number of Free Parameters                       32

Loglikelihood
          H0 Value                       -13714.894
          H0 Scaling Correction Factor        1.0106
            for MLR

          H1 Value                       -13657.442
          H1 Scaling Correction Factor        1.0143
            for MLR

Information Criteria
          Akaike (AIC)                    27493.789
          Bayesian (BIC)                  27641.631
          Sample-Size Adjusted BIC        27540.019
            (n* = (n + 2) / 24)
```

Did model fit get significantly worse? Nope.
$-2\Delta LL(df=1) = 1.01$, $p = .32$

```
Chi-Square Test of Model Fit
          Value                            113.113*
          Degrees of Freedom                   76
          P-Value                          0.0037
          Scaling Correction Factor        1.0158
            for MLR
```

```
Chi-Square Contributions From Each Group
          W                                  60.260
          M                                  52.853

RMSEA (Root Mean Square Error Of Approximation)
          Estimate                            0.036
          90 Percent C.I.                     0.021  0.049
          Probability RMSEA <= .05            0.957

CFI/TLI
          CFI                                 0.968
          TLI                                 0.969
```

Foreshadowing…

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group WOMEN				
Means (FACTOR MEAN FIXED=0 FOR IDENTIFICATION)				
DEPRESS	0.000	0.000	999.000	999.000
Group MEN				
Means (FREELY ESTIMATED TO BE FACTOR MEAN DIFFERENCE)				
DEPRESS	-0.094	0.085	-1.097	**0.273**

Unstandardized Results from Model 6 (Factor Variance Invariance): WILL BE OUR FINAL MODEL

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group WOMEN				
DEPRESS BY				
ITEM1	1.131	0.069	16.493	0.000
ITEM2	1.332	0.076	17.632	0.000
ITEM3	0.861	0.076	11.269	0.000
ITEM4	1.169	0.083	14.123	0.000
ITEM5	1.000	0.076	13.226	0.000
ITEM6	1.162	0.077	15.169	0.000
ITEM7	0.765	0.086	8.890	0.000
ITEM8	1.142	0.082	13.922	0.000
ITEM9	0.620	0.069	8.931	0.000
ITEM1 WITH (EQUAL TO CORRELATION=.268)				
ITEM2	0.491	0.159	3.080	0.002
Means (FACTOR MEAN FIXED=0 FOR IDENTIFICATION)				
DEPRESS	0.000	0.000	999.000	999.000
Intercepts				
ITEM1	4.229	0.078	53.982	0.000
ITEM2	3.763	0.093	40.555	0.000
ITEM3	1.886	0.087	21.615	0.000
ITEM4	3.528	0.096	36.886	0.000
ITEM5	2.292	0.090	25.463	0.000
ITEM6	3.862	0.091	42.541	0.000
ITEM7	**3.869**	**0.106**	**36.382**	**0.000**
ITEM8	3.610	0.094	38.347	0.000
ITEM9	1.261	0.071	17.671	0.000
Variances (FACTOR VARIANCE=1 FOR IDENTIFICATION)				
DEPRESS	1.000	0.000	999.000	999.000
Residual Variances				
ITEM1	1.452	0.145	9.989	0.000
ITEM2	2.302	0.178	12.927	0.000
ITEM3	3.646	0.143	25.467	0.000
ITEM4	3.571	0.197	18.119	0.000
ITEM5	3.478	0.161	21.625	0.000
ITEM6	2.899	0.199	14.536	0.000
ITEM7	**3.655**	**0.271**	**13.481**	**0.000**
ITEM8	3.368	0.207	16.280	0.000
ITEM9	2.809	0.143	19.649	0.000

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Group MEN				
DEPRESS BY				
ITEM1	1.131	0.069	16.493	0.000
ITEM2	1.332	0.076	17.632	0.000
ITEM3	0.861	0.076	11.269	0.000
ITEM4	1.169	0.083	14.123	0.000
ITEM5	1.000	0.076	13.226	0.000
ITEM6	1.162	0.077	15.169	0.000
ITEM7	0.765	0.086	8.890	0.000
ITEM8	1.142	0.082	13.922	0.000
ITEM9	0.620	0.069	8.931	0.000
ITEM1 WITH (EQUAL TO CORRELATION=.456)				
ITEM2	0.834	0.152	5.484	0.000
Means (FREELY ESTIMATED TO BE FACTOR MEAN DIFFERENCE)				
DEPRESS	-0.094	0.085	-1.097	0.273
Intercepts				
ITEM1	4.229	0.078	53.982	0.000
ITEM2	3.763	0.093	40.555	0.000
ITEM3	1.886	0.087	21.615	0.000
ITEM4	3.528	0.096	36.886	0.000
ITEM5	2.292	0.090	25.463	0.000
ITEM6	3.862	0.091	42.541	0.000
ITEM7	**3.493**	**0.123**	**28.385**	**0.000**
ITEM8	3.610	0.094	38.347	0.000
ITEM9	1.261	0.071	17.671	0.000
Variances (FACTOR VARIANCE NOT DIFFERENT THAN 1)				
DEPRESS	1.000	0.000	999.000	999.000
Residual Variances				
ITEM1	1.452	0.145	9.989	0.000
ITEM2	2.302	0.178	12.927	0.000
ITEM3	3.646	0.143	25.467	0.000
ITEM4	3.571	0.197	18.119	0.000
ITEM5	3.478	0.161	21.625	0.000
ITEM6	2.899	0.199	14.536	0.000
ITEM7	**4.626**	**0.260**	**17.771**	**0.000**
ITEM8	3.368	0.207	16.280	0.000
ITEM9	2.809	0.143	19.649	0.000

STRUCTURAL INVARIANCE TESTS
Model 7. Factor Mean Invariance Model

```
! WOMEN REFERENCE GROUP: CONFIGURAL MODEL
MODEL:
! Factor loadings all freely estimated, just labeled
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all freely estimated, just labeled
  [item1-item9*] (I1-I9);
! Residual variances all freely estimated, just labeled
  item1-item9* (E1-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2* (ECOV12);
! Factor variance fixed to 1 for identification
  DEPRESS@1;
! Factor mean fixed to 0 for identification
  [DEPRESS@0];
```

```
! MEN ALTERNATIVE GROUP: 7 FACTOR MEAN MODEL
MODEL Men:
! Factor loadings now labeled to be constrained to women's
  DEPRESS BY item1-item9* (L1-L9);
! Item intercepts all constrained to women's, but not 7
  [item1-item9*] (I1-I6 I7m I8-I9);
! Residual variances constrained to women's, but not 7
  item1-item9* (E1-E6 E7m E8-E9);
! Residual covariance (free for 1&2)
  item1 WITH item2*;
! Factor variance NOW CONSTRAINED EQUAL TO WOMEN'S
  DEPRESS@1;
! Factor mean NOW CONSTRAINED EQUAL TO WOMEN'S
  [DEPRESS@0];
```

```
Number of Free Parameters                       31

Loglikelihood
          H0 Value                       -13715.514
          H0 Scaling Correction Factor        1.0106
            for MLR

          H1 Value                       -13657.442
          H1 Scaling Correction Factor        1.0143
            for MLR

Information Criteria
          Akaike (AIC)                    27493.027
          Bayesian (BIC)                  27636.250
          Sample-Size Adjusted BIC        27537.813
            (n* = (n + 2) / 24)
```

Did model fit get significantly worse? Nope (as predicted).
$-2\Delta LL(df=1) = 1.23$, $p = .27$

```
Chi-Square Test of Model Fit
          Value                             114.340*
          Degrees of Freedom                     77
          P-Value                            0.0037
          Scaling Correction Factor          1.0158
            for MLR

Chi-Square Contributions From Each Group
          W                                  60.831
          M                                  53.509

RMSEA (Root Mean Square Error Of Approximation)
          Estimate                           0.036
          90 Percent C.I.                    0.021  0.049
          Probability RMSEA <= .05           0.960

CFI/TLI
          CFI                                0.967
          TLI                                0.970
```

All done!

Example Results of CFA with MLR Multiple Group Invariance Model Comparisons (Table 1 for model fit in Excel workbook):

The extent to which a confirmatory factor model measuring depression (with nine items each measured on a nine-point response scale) exhibited measurement and structural invariance between women and men was examined using M*plus* v. 8.4 (Muthén & Muthén, 1998–2017). Robust maximum likelihood (MLR) estimation was used for all analyses; accordingly, nested model comparisons were conducted using the −2LL rescaled difference test. Women served as the reference group in all invariance models. A configural invariance model was initially specified in which single-factor models were estimated simultaneously within each group; the factor mean was fixed to 0 and the factor variance was fixed to 1 for identification within each group. A residual covariance between items 1 and 2 was also estimated in each group as suggested by previous results. As shown in Table 1, the configural model had good fit, and thus a series of parameter constraints were then applied in successive models to examine potential decreases in fit resulting from measurement or structural non-invariance.

Equality of the unstandardized item factor loadings across groups was then examined in a metric invariance model in which the factor variance was fixed to 1 in women but was freely estimated in men; the factor means were fixed to 0 in both groups. All factor loadings were constrained to be equal across groups; all intercepts and residual variances (and the residual covariance between items 1 and 2) were still permitted to vary across groups. The metric invariance model fit well (see Table 1) and did not result in a significant decrease in fit relative to the configural model, $-2\Delta LL(8) = 4.26$, $p = .83$. The modification indices suggested no points of localized strain among the constrained loadings. The fact that metric invariance (i.e., “weak invariance”) held indicates that the items were related to the latent factor equivalently across groups, or more simply, that the same latent factor was being measured in each group.

Equality of the unstandardized item intercepts across groups was then examined in a scalar invariance model. The factor mean and variance were fixed to 0 and 1, respectively, for identification in the women, but the factor mean and variance were then estimated in the men. All factor loadings and item intercepts were constrained to be equal across groups; all residual variances (and the residual covariance between items 1 and 2) were still permitted to differ across groups. The scalar invariance model fit well (see Table 1) and did not result in a significant decrease in fit relative to the metric invariance model, $-2\Delta LL(8) = 12.39$, $p = .13$. However, examination of the modification indices suggested a point of localized strain; accordingly, a partial scalar invariance model was thus estimated in which the intercept for item 7 (“feelings of worthless or guilt”) was allowed to differ between groups, resulting in a good-fitting model and a significantly better-fitting model relative to the full scalar invariance model, $-2\Delta LL(1) = 5.93$, $p = .01$. The partial scalar invariance did not fit significantly worse than the metric invariance model, $-2\Delta LL(7) = 6.36$, $p = .50$, indicating that partial scalar invariance did hold. The factor that partial scalar invariance (i.e., “strong invariance”) held indicates that both groups have the same expected item response at the same absolute level of the trait, or more simply, that the observed differences in item means between groups is due to factor mean differences only. The exception to this is item 7, for which women are expected to have a higher item response than men at the same absolute trait level of depression.

Equality of the unstandardized residual variances across groups was then examined in a residual variance invariance model. As in the partial scalar invariance model, the factor mean and variance were fixed to 0 and 1, respectively, for identification in the women, but the factor mean and variance were still estimated in the men. All factor loadings, item intercepts (except for item 7), and all residual variances (except for item 7) were constrained to be equal across groups; the residual covariance between item 1 and 2 was still permitted to differ across groups. The residual variance invariance model fit well (see Table 1) and did not result in significant decrease in fit relative to the partial scalar invariance model, $-2\Delta LL(8) = 5.27$, $p = .73$. The modification indices suggested no points of localized strain among the constrained residual variances. The fact that residual variance invariance (i.e., “strict invariance”) held indicates that the amount of item variance not accounted for by the factor was the same across groups. Finally, equality of the residual covariance between items 1 and 2 across groups was tested and resulted in a significant decrease in fit relative to the residual invariance model, $-2\Delta LL(1) = 4.18$, $p = .04$, indicating that the residual relationship between items 1 and 2 differed significantly between men and women. The residual covariance between items 1 and 2 was thus permitted to vary across groups in further models.

After achieving partial measurement invariance as just described, structural invariance was then tested with two additional models. First, the factor variance in men (which had been estimated freely) was constrained to 1 (i.e., to be equal to the factor variance in the women), resulting in a nonsignificant decrease in fit relative to the residual invariance model, $-2\Delta LL(1) = 1.01$, $p = .31$. Thus, men and women had equivalent amounts of individual differences in depression. Second, the factor mean in men (which had been estimated freely) was constrained to 0 (i.e., to be equal to the factor mean in women), resulting in a nonsignificant decrease in fit relative to the factor variance invariance model, $-2\Delta LL(1) = 1.23$, $p = .27$, indicating that men and women had comparable

amounts of depression on average. Thus, in conclusion, these analyses showed that partial measurement invariance was obtained between men and women—that is, the relationships of the items to the latent trait of depression were equivalent in both groups (except for the intercept and residual variance for item 7). These analyses also showed that full structural invariance was obtained between men and women, such that both groups had the same average amount of depression and extent of interindividual variation in depression as measured by these nine items. The fact that both the factor variances and item residual variances could be constrained equal across groups also indicates equal reliability of the items (i.e., equal standardized factor loadings) across groups, with the exception of item 7. Model parameters from the final invariance model are given in Table 2.

Reference: Muthén, L. K., & Muthén, B.O. (1998–2017). *Mplus user's guide* (8th ed.). Los Angeles, CA: Muthén & Muthén.

Table 1

Model fit statistics for tests of multiple group measurement and structural invariance

Model	# Free Parms	Chi-Square Value	Chi-Square Scale Factor	Chi-Square DF	Chi-Square p-value	CFI	RMSEA Estimate	RMSEA Lower CI	RMSEA Higher CI	RMSEA p-value
1. Configural Model	56	94.175	1.0503	52	0.0003	0.963	0.047	0.031	0.061	0.632
2a. Metric Model	48	99.532	1.0332	60	0.0010	0.966	0.042	0.027	0.056	0.814
3a. Scalar Model	40	111.950	1.0300	68	0.0006	0.962	0.042	0.027	0.055	0.842
3b. Partial Scalar (no Item 7)	41	106.031	1.0300	67	0.0017	0.966	0.039	0.024	0.053	0.892
4a. Residual (no Item 7)	33	112.019	1.0182	75	0.0036	0.968	0.036	0.021	0.050	0.954
5a. Residual Covariance	32	119.281	1.0341	76	0.0011	0.962	0.039	0.025	0.052	0.916
6a. Factor Variance	32	113.113	1.0158	76	0.0037	0.968	0.036	0.021	0.049	0.957
7a. Factor Mean	31	114.340	1.0158	77	0.0037	0.967	0.036	0.021	0.049	0.960

Table 2 would have actual model parameters…. (unstandardized and standardized estimates and their SEs, so 4 columns)

You might also replace all the nested model comparisons tests in the text with a table that provides them instead.