1 Measurement Invariance of the Dirty Dozen: Student and Working Adult Samples

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Abstract

Now we are evaluating the psychometric properties of the dirty dozen simplified Chinese version by using samples in real settings: job applicants and incumbents (in addition to students). We replicate a previous study using the student sample, then continue to evaluate with organizational data. We find that the scales are non-invariant. Seems to be revisiting these articles: Geng, Sun, Huang, Zhu, and Han (2015) and Grigoras, Butucescu, Miulescu, Opariuc-Dan, and Iliescu (2020)

Keywords: keywords

Word count: X

20   Measurement Invariance of the Dirty Dozen: Student and Working Adult Samples

21   Initially we were interested in looking at reliance on student samples. Now we are

22   evaluating the psychometric properties of the dirty dozen (DD) simplified Chinese version by

23   using samples in real settings: job applicants and incumbents (in addition to students). We

24   replicate a previous study using the student sample (Yang gonna send some articles), then

25   continue to evaluate with organizational data. We find that the scales are non-invariant.

26   SDSME another version (27 items).

27   All studies investigating psychometric properties of these scales use University students.

28   Some groups may be expected to exhibit different item-construct associations due to

29   shifting motivational forces.

30   ITC guidlines for translating and adapting tests recommends looking at possible

31   differences across motives (Commission, 2017). For example,

32   Yang's references: Church et al. (2011), Schoot, Lugtig, and Hox (2012), Schmitt and

33   Kuljanin (2008), Geng, Sun, Huang, Zhu, and Han (2015), Grigoras, Butucescu, Miulescu,

34   Opariuc-Dan, and Iliescu (2020), Jonason and Webster (2010)

Methods

36   We follow the We also look at intercorrelations among items within the samplings.

Participants

38   In total 1106 individuals responded to the Dirty Dozen (as well as additional scales not

39   the focus of the current presentation). This total was comprised of 208 working adults

40   low-stakes, 527 working adults high-stakes, and 371 students low-stakes individuals. After

41   screening for undifferentiated responses via the R package careless (Yentes & Wilhelm,

⁴² 2021), we retained 1054 respondents who had no more than 6 sequentially identical responses

⁴³ across the 12 total items.

Material

Procedure

⁴⁶   Decrease in $\Delta\chi^2$ across models indicates a lack of invariance (typically not considered a

⁴⁷ "good thing"). Multiple indices are consulted across models, including $\Delta\chi^2$, RMSEA, CFI,

⁴⁸ TLI, BIC, and AIC.

⁴⁹   Also want to look at correlations of the simplified Chinese version of the DD with the

⁵⁰ Honesty-Humility subscales (Sincerity, Fairness, Greed Avoidance, and Modesty).

Data analysis

⁵²   We used R [Version 4.0.5; R Core Team (2021)] and the R-packages *careless* [Version

⁵³ 1.2.1; Yentes and Wilhelm (2021)], *corx* [Version 1.0.6.1; Conigrave (2020)], *foreign* [Version

⁵⁴ 0.8.81; R Core Team (2020)], *lavaan* [Version 0.6.8; Rosseel (2012)], *papaja* [Version

⁵⁵ 0.1.0.9997; Aust and Barth (2020)], and *semTools* [Version 0.5.5; Jorgensen,

⁵⁶ Pornprasertmanit, Schoemann, and Rosseel (2021)] for all our analyses.

Results

⁵⁸   We looked at structural invariance as well as latent means (Meredith, 1993; Steinmetz,

⁵⁹ Schmidt, Tina-Booh, Wieczorek, & Schwartz, 2009). The models failed to exhibit metric

⁶⁰ invariance (Model 2 - Model 1 exhibited a significant Δ on both χ^2 as well as RMSEA)

⁶¹   Not sure how to pull table or identify object elements - `model1` object is too

⁶² large to navigate easily.

⁶³ `##`

⁶⁴ `## Measurement invariance models:`

```
65  ##
66  ## Model 1 : fit.configural
67  ## Model 2 : fit.loadings
68  ## Model 3 : fit.intercepts
69  ## Model 4 : fit.means
70  ##
71  ## Chi-Squared Difference Test
72  ##
73  ##                   Df   AIC   BIC  Chisq Chisq diff Df diff Pr(>Chisq)
74  ## fit.configural 153 37059 37640 1407.7
75  ## fit.loadings   171 37135 37626 1518.9     111.25      18  1.837e-15 ***
76  ## fit.intercepts 189 37230 37632 1650.5     131.54      18  < 2.2e-16 ***
77  ## fit.means      195 37344 37716 1775.9     125.40       6  < 2.2e-16 ***
78  ## ---
79  ## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
80  ##
81  ##
82  ## Fit measures:
83  ##
84  ##                  cfi rmsea cfi.delta rmsea.delta
85  ## fit.configural 0.641 0.153        NA          NA
86  ## fit.loadings   0.615 0.150     0.027       0.003
87  ## fit.intercepts 0.582 0.148     0.032       0.001
88  ## fit.means      0.548 0.152     0.034       0.004

89  ## lavaan 0.6-8 ended normally after 108 iterations
90  ##
91  ##   Estimator                                         ML
```

```
92  ##    Optimization method                           NLMINB

93  ##    Number of model parameters                       117

94  ##

95  ##    Number of observations per group:

96  ##       working adults low-stakes                      191

97  ##       working adults high-stakes                     510

98  ##       students low-stakes                            351

99  ##

100 ## Model Test User Model:

101 ##

102 ##    Test statistic                              1407.674

103 ##    Degrees of freedom                               153

104 ##    P-value (Chi-square)                           0.000

105 ##    Test statistic for each group:

106 ##       working adults low-stakes                  182.467

107 ##       working adults high-stakes                 523.812

108 ##       students low-stakes                        701.395

109 ##

110 ## Model Test Baseline Model:

111 ##

112 ##    Test statistic                              3696.466

113 ##    Degrees of freedom                               198

114 ##    P-value                                        0.000

115 ##

116 ## User Model versus Baseline Model:

117 ##

118 ##    Comparative Fit Index (CFI)                    0.641
```

```
119  ##    Tucker-Lewis Index (TLI)                          0.536
120  ##
121  ## Loglikelihood and Information Criteria:
122  ##
123  ##    Loglikelihood user model (H0)              -18412.727
124  ##    Loglikelihood unrestricted model (H1)      -17708.890
125  ##
126  ##    Akaike (AIC)                                37059.454
127  ##    Bayesian (BIC)                              37639.593
128  ##    Sample-size adjusted Bayesian (BIC)         37267.983
129  ##
130  ## Root Mean Square Error of Approximation:
131  ##
132  ##    RMSEA                                           0.153
133  ##    90 Percent confidence interval - lower          0.146
134  ##    90 Percent confidence interval - upper          0.160
135  ##    P-value RMSEA <= 0.05                           0.000
136  ##
137  ## Standardized Root Mean Square Residual:
138  ##
139  ##    SRMR                                            0.110
140  ##
141  ## Parameter Estimates:
142  ##
143  ##    Standard errors                              Standard
144  ##    Information                                  Expected
145  ##    Information saturated (h1) model            Structured
```

```
146  ##

147  ##

148  ## Group 1 [working adults low-stakes]:

149  ##

150  ## Latent Variables:

151  ##                   Estimate  Std.Err  z-value  P(>|z|)

152  ##   mach =~

153  ##     A30             1.000

154  ##     A31             0.392    0.095    4.111    0.000

155  ##     A32             0.224    0.096    2.332    0.020

156  ##     A33             0.538    0.063    8.507    0.000

157  ##   narc =~

158  ##     A34             1.000

159  ##     A35             0.262    0.263    0.996    0.319

160  ##     A36             1.982    0.367    5.394    0.000

161  ##     A37             1.752    0.332    5.277    0.000

162  ##   psyc =~

163  ##     A38             1.000

164  ##     A39             1.328    0.240    5.541    0.000

165  ##     A40             0.820    0.195    4.196    0.000

166  ##     A41             0.814    0.205    3.969    0.000

167  ##

168  ## Covariances:

169  ##                   Estimate  Std.Err  z-value  P(>|z|)

170  ##   mach ~~

171  ##     narc            0.311    0.066    4.691    0.000

172  ##     psyc            0.700    0.144    4.859    0.000
```

```
173  ##   narc ~~
174  ##     psyc            0.251   0.065    3.863    0.000
175  ##
176  ## Intercepts:
177  ##                   Estimate  Std.Err  z-value  P(>|z|)
178  ##     .A30            1.948    0.089   21.789    0.000
179  ##     .A31            1.901    0.083   22.999    0.000
180  ##     .A32            4.607    0.083   55.484    0.000
181  ##     .A33            1.340    0.056   24.095    0.000
182  ##     .A34            1.393    0.061   22.680    0.000
183  ##     .A35            4.267    0.091   46.791    0.000
184  ##     .A36            1.890    0.083   22.892    0.000
185  ##     .A37            1.508    0.078   19.429    0.000
186  ##     .A38            2.984    0.122   24.507    0.000
187  ##     .A39            1.759    0.087   20.119    0.000
188  ##     .A40            2.031    0.100   20.231    0.000
189  ##     .A41            3.288    0.109   30.174    0.000
190  ##     mach            0.000
191  ##     narc            0.000
192  ##     psyc            0.000
193  ##
194  ## Variances:
195  ##                   Estimate  Std.Err  z-value  P(>|z|)
196  ##     .A30            0.678    0.099    6.865    0.000
197  ##     .A31            1.174    0.122    9.608    0.000
198  ##     .A32            1.274    0.131    9.725    0.000
199  ##     .A33            0.345    0.041    8.401    0.000
```

```
200  ##      .A34                 0.562   0.063   8.951   0.000

201  ##      .A35                 1.578   0.162   9.753   0.000

202  ##      .A36                 0.682   0.099   6.890   0.000

203  ##      .A37                 0.666   0.088   7.523   0.000

204  ##      .A38                 2.350   0.247   9.509   0.000

205  ##      .A39                 0.610   0.098   6.251   0.000

206  ##      .A40                 1.601   0.168   9.514   0.000

207  ##      .A41                 1.948   0.204   9.572   0.000

208  ##       mach                0.848   0.157   5.419   0.000

209  ##       narc                0.158   0.052   3.008   0.003

210  ##       psyc                0.482   0.172   2.812   0.005

211  ##

212  ##

213  ## Group 2 [working adults high-stakes]:

214  ##

215  ## Latent Variables:

216  ##                       Estimate  Std.Err  z-value  P(>|z|)

217  ##    mach =~

218  ##      A30                 1.000

219  ##      A31                 0.495   0.059   8.361   0.000

220  ##      A32                 0.152   0.060   2.537   0.011

221  ##      A33                 0.398   0.031  12.716   0.000

222  ##    narc =~

223  ##      A34                 1.000

224  ##      A35                 0.377   0.148   2.544   0.011

225  ##      A36                 1.683   0.188   8.946   0.000

226  ##      A37                 0.622   0.098   6.323   0.000
```

```
227 ##     psyc =~
228 ##       A38                1.000
229 ##       A39                1.148    0.139    8.287    0.000
230 ##       A40                0.408    0.087    4.692    0.000
231 ##       A41                0.864    0.142    6.100    0.000
232 ##
233 ## Covariances:
234 ##                      Estimate  Std.Err  z-value  P(>|z|)
235 ##     mach ~~
236 ##       narc               0.336    0.038    8.881    0.000
237 ##       psyc               0.579    0.079    7.293    0.000
238 ##     narc ~~
239 ##       psyc               0.251    0.039    6.388    0.000
240 ##
241 ## Intercepts:
242 ##                      Estimate  Std.Err  z-value  P(>|z|)
243 ##      .A30               1.761    0.050   34.986    0.000
244 ##      .A31               1.727    0.047   36.930    0.000
245 ##      .A32               4.788    0.047  101.300    0.000
246 ##      .A33               1.204    0.025   48.421    0.000
247 ##      .A34               1.224    0.033   36.737    0.000
248 ##      .A35               4.422    0.050   87.885    0.000
249 ##      .A36               1.825    0.050   36.532    0.000
250 ##      .A37               1.198    0.030   39.522    0.000
251 ##      .A38               3.076    0.075   40.922    0.000
252 ##      .A39               1.539    0.044   35.365    0.000
253 ##      .A40               1.557    0.048   32.693    0.000
```

```
254  ##    .A41                2.800   0.069   40.364    0.000

255  ##     mach               0.000

256  ##     narc               0.000

257  ##     psyc               0.000

258  ##

259  ## Variances:

260  ##                     Estimate  Std.Err  z-value  P(>|z|)

261  ##    .A30                0.564   0.053   10.564    0.000

262  ##    .A31                0.938   0.061   15.403    0.000

263  ##    .A32                1.123   0.070   15.926    0.000

264  ##    .A33                0.200   0.014   14.029    0.000

265  ##    .A34                0.434   0.030   14.306    0.000

266  ##    .A35                1.272   0.080   15.941    0.000

267  ##    .A36                0.902   0.068   13.291    0.000

268  ##    .A37                0.418   0.027   15.564    0.000

269  ##    .A38                2.415   0.158   15.304    0.000

270  ##    .A39                0.350   0.048    7.324    0.000

271  ##    .A40                1.079   0.069   15.726    0.000

272  ##    .A41                2.105   0.137   15.401    0.000

273  ##     mach               0.728   0.083    8.767    0.000

274  ##     narc               0.131   0.026    4.974    0.000

275  ##     psyc               0.468   0.108    4.315    0.000

276  ##

277  ##

278  ## Group 3 [students low-stakes]:

279  ##

280  ## Latent Variables:
```

```
281 ##                       Estimate  Std.Err  z-value  P(>|z|)

282 ##    mach =~

283 ##       A30             1.000

284 ##       A31             0.322    0.076    4.220    0.000

285 ##       A32             0.424    0.063    6.764    0.000

286 ##       A33             0.854    0.078   10.963    0.000

287 ##    narc =~

288 ##       A34             1.000

289 ##       A35             1.286    0.240    5.359    0.000

290 ##       A36             1.756    0.300    5.853    0.000

291 ##       A37             1.486    0.276    5.387    0.000

292 ##    psyc =~

293 ##       A38             1.000

294 ##       A39             1.430    0.150    9.551    0.000

295 ##       A40             0.785    0.119    6.627    0.000

296 ##       A41             1.130    0.140    8.083    0.000

297 ##

298 ## Covariances:

299 ##                       Estimate  Std.Err  z-value  P(>|z|)

300 ##    mach ~~

301 ##       narc            0.433    0.076    5.678    0.000

302 ##       psyc            0.794    0.105    7.585    0.000

303 ##    narc ~~

304 ##       psyc            0.326    0.060    5.403    0.000

305 ##

306 ## Intercepts:

307 ##                       Estimate  Std.Err  z-value  P(>|z|)
```

```
308 ##     .A30             2.627   0.082   31.924    0.000

309 ##     .A31             2.316   0.072   32.342    0.000

310 ##     .A32             4.826   0.057   84.238    0.000

311 ##     .A33             1.801   0.066   27.348    0.000

312 ##     .A34             1.638   0.063   26.055    0.000

313 ##     .A35             4.490   0.063   70.785    0.000

314 ##     .A36             2.083   0.067   30.984    0.000

315 ##     .A37             1.892   0.072   26.127    0.000

316 ##     .A38             3.903   0.073   53.138    0.000

317 ##     .A39             2.205   0.074   29.698    0.000

318 ##     .A40             1.829   0.072   25.382    0.000

319 ##     .A41             3.903   0.078   49.869    0.000

320 ##      mach            0.000

321 ##      narc            0.000

322 ##      psyc            0.000

323 ##

324 ## Variances:

325 ##                   Estimate  Std.Err  z-value  P(>|z|)

326 ##     .A30             1.474   0.124   11.919    0.000

327 ##     .A31             1.707   0.129   13.240    0.000

328 ##     .A32             0.990   0.075   13.148    0.000

329 ##     .A33             0.863   0.076   11.335    0.000

330 ##     .A34             1.276   0.095   13.396    0.000

331 ##     .A35             1.227   0.093   13.238    0.000

332 ##     .A36             1.241   0.099   12.522    0.000

333 ##     .A37             1.593   0.120   13.220    0.000

334 ##     .A38             1.407   0.109   12.936    0.000
```
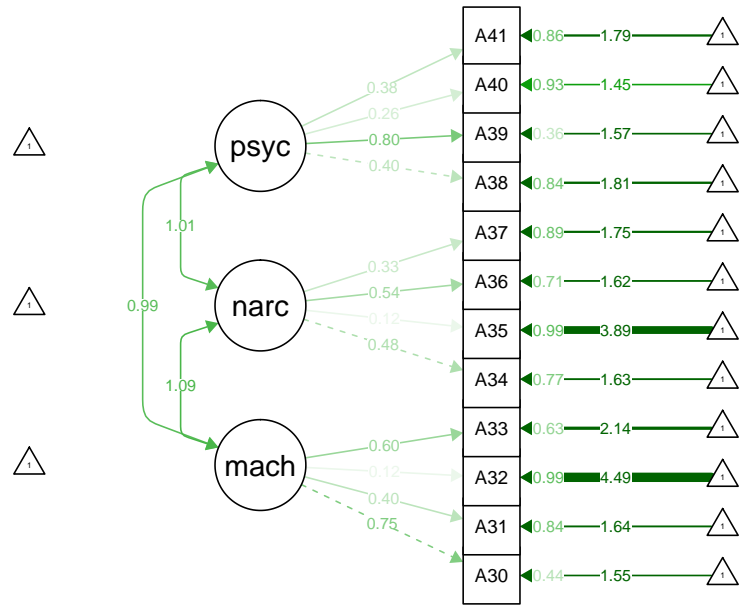
335	##	.A39	0.938	0.085	11.028	0.000
336	##	.A40	1.522	0.116	13.139	0.000
337	##	.A41	1.528	0.119	12.827	0.000
338	##	mach	0.903	0.151	5.989	0.000
339	##	narc	0.112	0.039	2.896	0.004
340	##	psyc	0.487	0.099	4.944	0.000

1

341

2
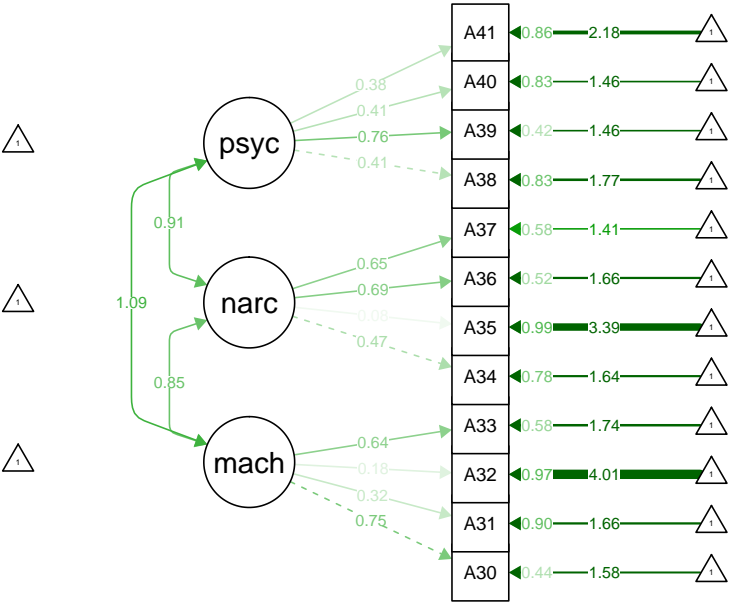
342

3
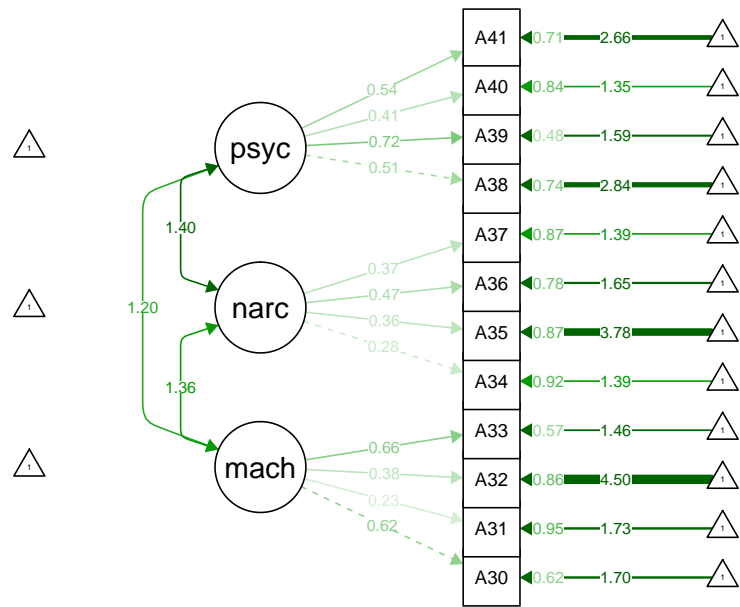
343

344   Yang also wanted correlations

345   **Discussion**

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Table 1

Scale intercorrelations (all participants).

	1	2	3	4	5	6	7	*M*	*SD*
1. Machiavelliansm	-							1.62	0.78
2. Narcissism	.29***	-						3.69	1.07
3. Psychopathy	.57***	.19***	-					1.51	0.62
4. Fairness	-.34***	-.02	-.45***	-				5.40	0.84
5. GreedAvoidance	-.26***	-.45***	-.24***	.27***	-			3.52	1.14
6. Modesty	-.23***	-.43***	-.17***	.15**	.43***	-		3.72	0.85
7. Sincerity	-.14**	.04	-.04	.23***	.11*	.18***	-	3.85	0.74
8. HonestyHumility	-.38***	-.37***	-.35***	.61***	.77***	.68***	.51***	4.12	0.59

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

	Constrained parameters	Free parameters	comparison model
configural	FMean (=0)	fl+inter+res+var	
Weak/loading invariance	fl+Fmean (=0)	inter+res+var	configural
Strong/scalar invariance	fl+inter	res+var+Fmean*	Weak/loading invariance
strict invariance	fl+inter+res	Fmean*+var	Strong/scalar invariance

Note. fl= factor loadings, inter = item intercepts, res = item residual variances, Fmean = mean of latent variable, var = variance of latent variable

*Fmean is fixed to 0 in group 1 and estimated in the other group(s)

Figure 1. Steps for measurement invariance (taken from Xu, 2012).