The webinar, “Factorial Invariance of the Centre for Epidemiological Studies Depression Scale (CES-D),” will begin shortly.

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CLSA Webinar Series

Factorial Invariance of the Centre for Epidemiological Studies Depression Scale (CES-D)

Megan E. O'Connell, Ph.D., R.D. Psych.

1 to 2 p.m. ET | June 29, 2017

Dr. Megan O'Connell is an associate professor of psychology at the University of Saskatchewan. She practices clinical neuropsychology at the interdisciplinary Rural and Remote Memory Clinic and researches the use of technology for rural dementia care. Dr. O'Connell is a member of the Psychology Working Group in the Canadian Longitudinal Study on Aging (CLSA). She is currently working with a CLSA team in developing normative papers for the neuropsychological batteries and psychometric properties of the depression state.

This webinar focuses upon the Centre for Epidemiological Studies Depression Scale (CES-D). A 10-item short form (CES-D-10) used in the CLSA measures two distinct factors related to depressive systems: depressed affect and lack of positive affect. Dr. O'Connell explores how respondent characteristics (e.g. language, age) impact how the CES-D-10 measures depression.

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Factorial Invariance of the CES-D-10: The Center for Epidemiological Studies – Depression Scale 10 Item

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Presenter Disclosure

- Presenter: Dr. Megan O'Connell
- Relationships with commercial interests: none
- Potential for conflicts of interest: none

CES-D-10 Items used in CLSA

- How often were you bothered by things that usually don't bother you?
- How often did you have trouble keeping your mind on what you were doing?
- How often did you feel depressed?
- How often did you feel that everything you did was an effort?
- How often did you feel hopeful about the future? (reverse scored)
- How often did you feel fearful or tearful?
- How often was your sleep restless?
- How often were you happy? (reverse scored)
- How often did you feel lonely?
- How often did you feel that you could not "get going"?

CESD-10 Responses

CLSA 4-point response key

1. All of the time
2. Occasionally
3. Some of the time
4. Rarely or never

- 8) Don’t know/no answer
- 9) Refused

Possible Factor Structure of the CES-D-10

- Depressed Affect – 8 items
- Positive Affect - 2 items

Controversies RE: Factor Structure

- 2 factors versus 1 (rarely 3)
- Differences in factor structure for subgroups
  - e.g., Baran et al., 2017 2 factor for Zulu and Xhosa participants and 1 for Afrikaans participants in South Africa
  - e.g., Lee & Chokkanathan, 2008 2 factors invariant to male/female in a sample of Singaporean older adults
  - O'Rourke, 2003 longer CES-D with more complicated factor structure was invariant to English/French

Why Should You Care?

- Understanding the factor structure of the CES-D-10 will inform you about how you can use the 2 factors, which are potentially separable aspects of depressed mood (negative affect and lack of positive affect)
- If MI is established, observed mean differences can be attributed to differences in the underlying construct of depressed mood

Factorial Invariance

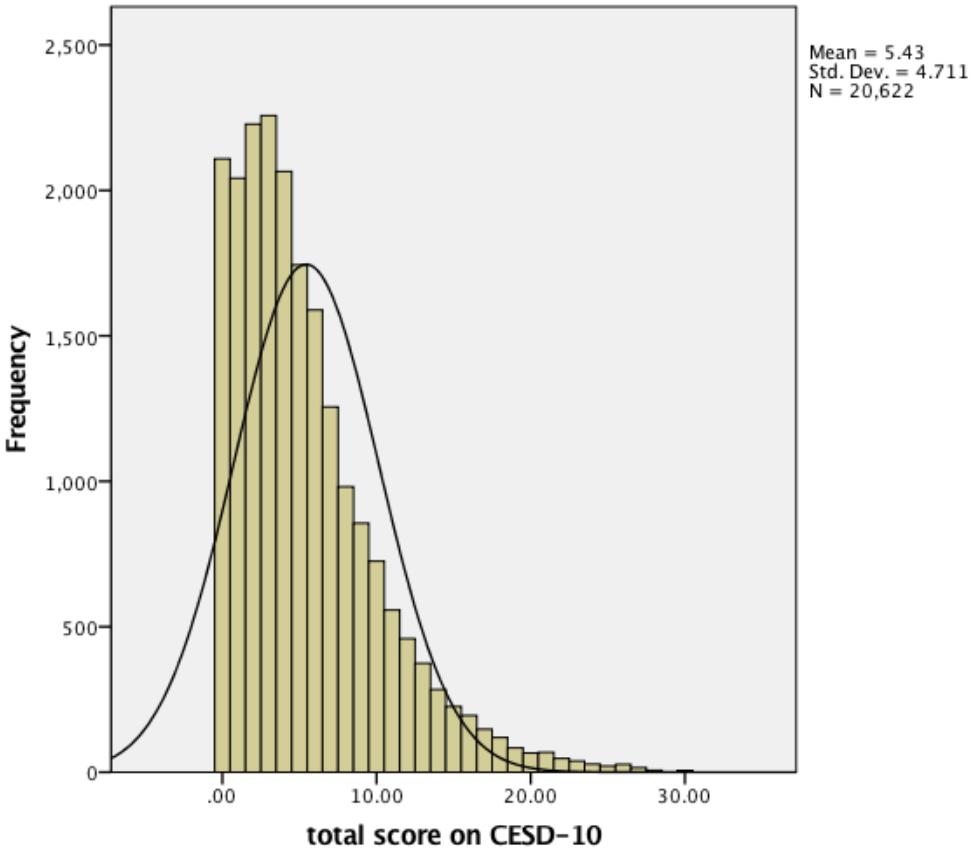
- We do not directly measure a psychological state such as depressed mood
- Unobserved variables (latent variables) – inferred by observing the variables we do see
- Are responses on the depression scale driven by the same underlying variable – 'depression'?
- Are these underlying variables the same for all who respond to the scale – factorial invariance

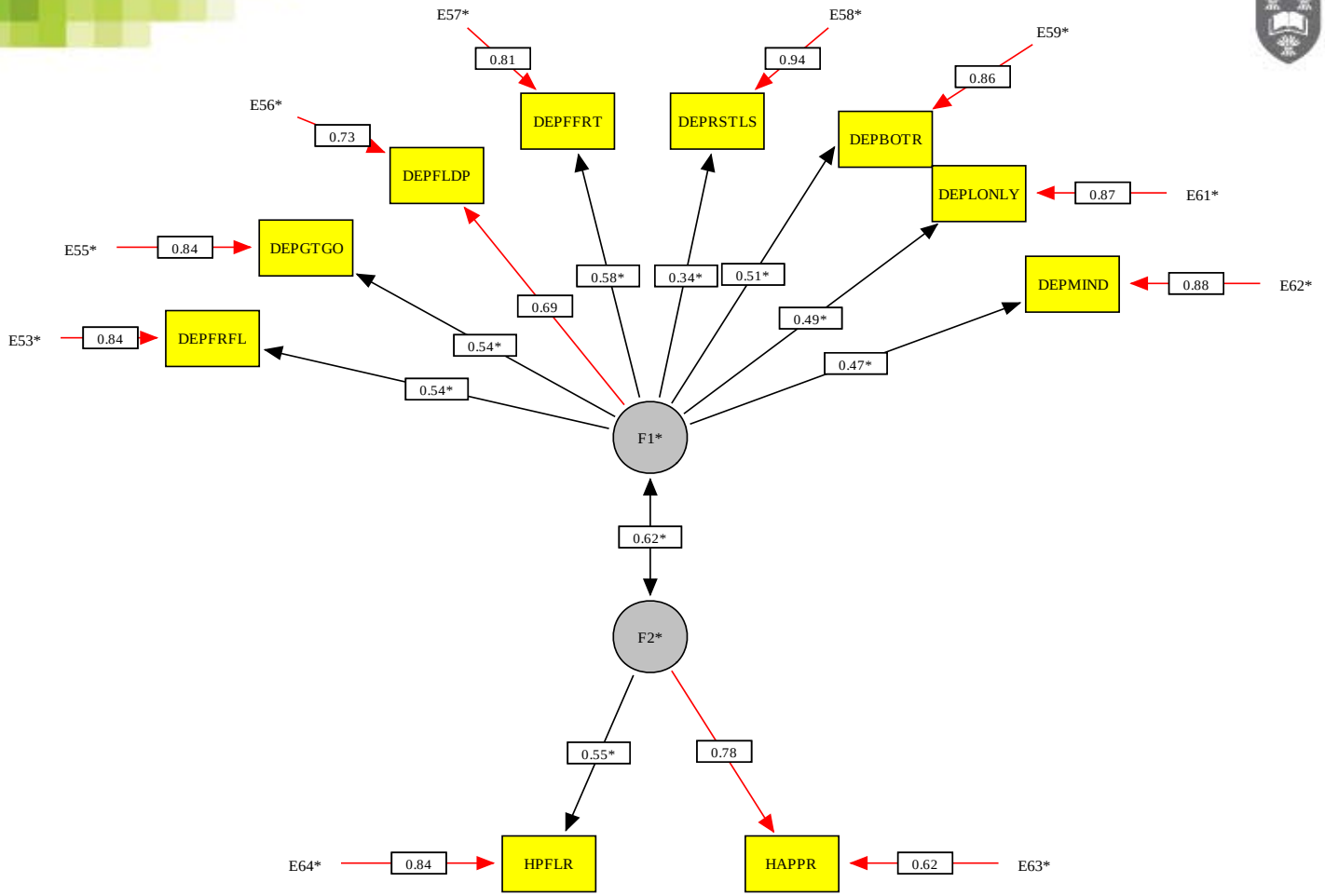
Factorial Invariance

- Multi-group confirmatory factor analysis – MG-CFA
- If you have the same level of the latent variable (e.g., ‘depression’) do you have the same score on the measure?
- If the measure has evidence for measurement invariance, then group mean differences can be attributed to differences between groups in the underlying construct

Methodological Approach

- CLSA CES-D complete
- *N* = 20,622
- Positive skew





Overall CFA

Figure X: EQS 6 cesd two factors.eds Chi Sq.=2064.40 P=0.00 CFI=0.94 RMSEA=0.05

Unconstrained Model

- CFI = .944, RMSEA = .054, $\chi^2(df = 34, N = 20{,}622) = 2064.37, p < .001$

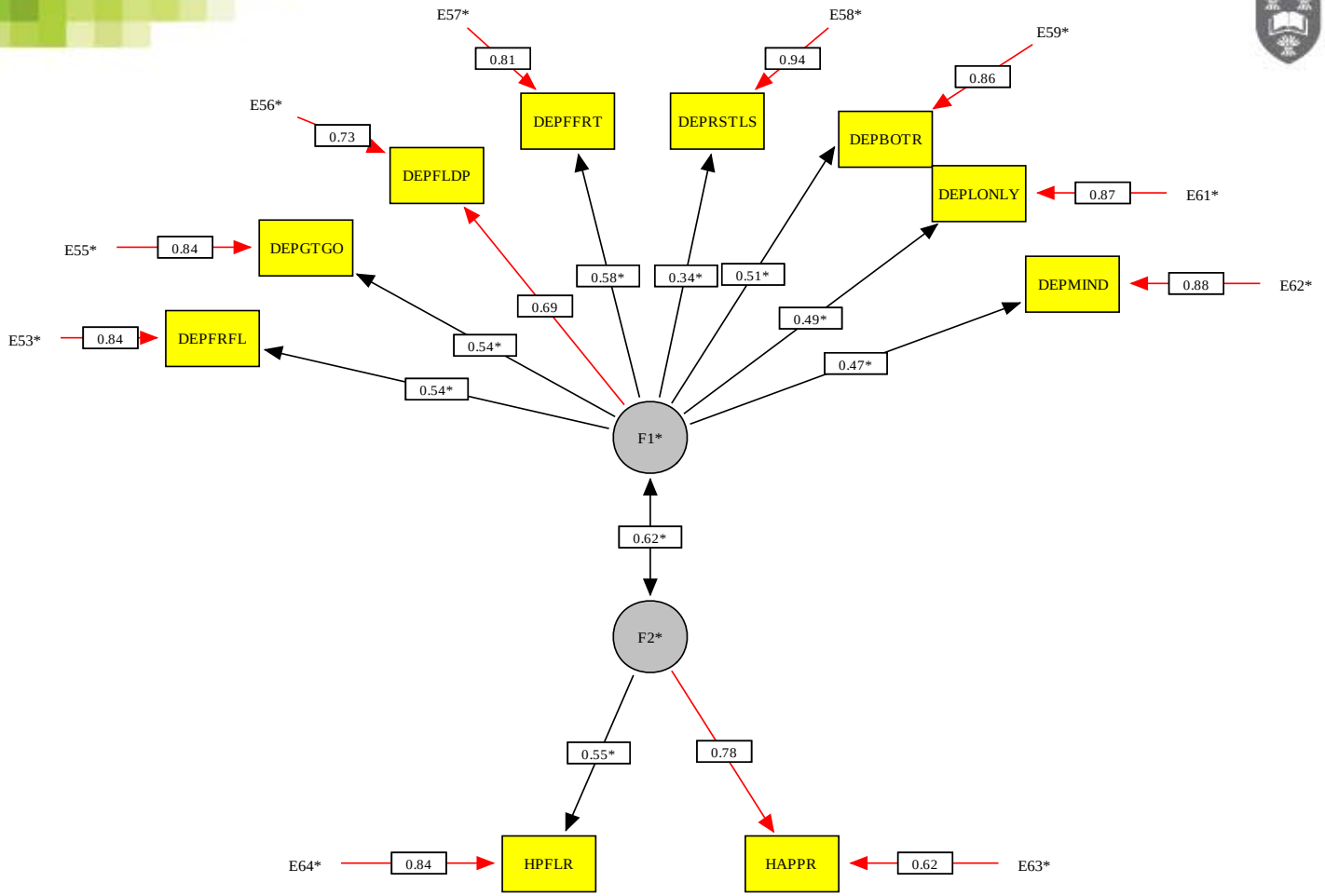
- The loadings were moderate in size and the two factors were quite highly correlated ($r = 0.61$)

Groups Explored for Factorial Invariance

- Males (10,085)/Females(10,537)
- Younger (12,126)/Older (8,496) based on age 65 as a cutoff
- English (16,543)/French (3,781)
- Western European ancestry (17,413)/other (3,209)
- Anxiety (1,500)/none (19,101)
- Memory problems (427)/none (20,187)

Levels of Factorial Invariance MG-CFA

- Configural invariance – = # numbers of factors
- Weak invariance – = number of factors and loadings the same for each subgroup
- Strong invariance – in addition, factors means are = (intercept constrained)
- Strict invariance – in addition, error in estimation is the same (residuals constrained)



Overall CFA

Figure X: EQS 6 cesd two factors.eds Chi Sq.=2064.40 P=0.00 CFI=0.94 RMSEA=0.05

Configural Invariance

- For each group, are there 2 factors
  - Yes for all
    - Younger/older
    - Men/Women
    - English/French
    - Western European background/Others
    - Anxiety/None
    - Memory Problems/None

Weak Invariance

- If you constraint the factor loadings to be similar for the groups, is the model still a good fit
  - Yes for all
    - Younger/older
    - Men/Women
    - English/French
    - Western European background/Others
    - Anxiety/None
    - Memory Problems/None

Weak Invariance

- Conclusions: the model is good across the subgroup analyses when you impose the constraint that the factor loadings for the items on the factors have to be equal in the two subgroups
- Measuring the same factors with the same loadings – some argue is sufficient

The Case for Strong/Strict Invariance

- Most report weak invariance as sufficient for MI (Vandenberg & Lance, 2000 review of MI in psychology)
- Others argue strong and strict invariance is needed (Meredith & Teresi, 2006; Wu et al., 2007)

Case for Strong Invariance

- If there are unequal factor means (intercepts unequal) this could represent bias
- Score on that factor would depend on group membership

Case for Strict Invariance

- Residual - variance in each test item not accounted for by the latent factor
- Fixing residuals to be equal – if residuals are not intercorrelated can assume that they are comprised solely of random error
- If (which is common) they are intercorrelated and there are different across subgroups
  - different variables (unmeasured, thus captured in residuals) operating on the same measures across groups or
  - the same set of variables operates differently across groups

Future Analyses

- Constrain factor means – strong invariance
- Constrain residuals – strict invariance

- Explore subgroups based on cognitive status
  - Normative data for telephone administered cognitive tests being developed (Tuokko et al.,)
  - Does cognitive status impact CES-D-10 responding

Thank you

- To my collaborator who did these analyses in EQS **Dr. Peter Grant**
- To my RA for lit review support – **Michelle McLean**
- To CLSA (particularly **Drs. Raina, Wolfson, & Kirkland**) for their support of this psychometric project

- Compared the young versus old group with the constraint that the loading of each item on the relevant factor was the same in each group. The goodness of fit was still good; sRMR = 0.034, RMSEA = 0.052, CFI = .942, $\chi^2(76, N_{old} = 8496, N_{young} = 12,126) = 2184.01$, $p < .001$.

- Compared women with men using the same constraints. The goodness of fit was still good; sRMR = 0.036, RMSEA = 0.053, CFI = .939, $\chi^2(76, N_{women} = 10537, N_{men} = 10085) = 2265.40$, $p < .001$.

- Compared English versus French speaking with the same constraints. The goodness of fit was still good; sRMR = 0.033, RMSEA = 0.051, CFI = .943, $\chi2(76, N_{eng} = 16,543, N_{french} = 3781) = 2095.11$, $p < .001$.

- Compared Western European with others with the same constraints. The goodness of fit was still good; sRMR = 0.033, RMSEA = 0.051, CFI = .943, $\chi2(76, N_{WEuro} = 17,413, N_{other} = 3209) = 2130.36$, $p < .001$.

- Compared those with memory problems with the rest. The goodness of fit was still good; sRMR = 0.057, RMSEA = 0.051, CFI = .942, $\chi2(76, N_{mem} = 427, N_{no\ mem} = 20,187) = 2103.58$, $p < .001$.

- Compared those with anxiety with the rest. The goodness of fit was still good; sRMR = 0.048, RMSEA = 0.052, CFI = .936, $\chi2(76, N_{anxiety} = 1,500, N_{no\ anxiety} = 19,101) = 2195.08$, $p < .001$.

Upcoming CLSA Webinars

Thank you for attending the CLSA Webinar Series. Webinars will resume in September 2017.

For updates, please visit the CLSA website.

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