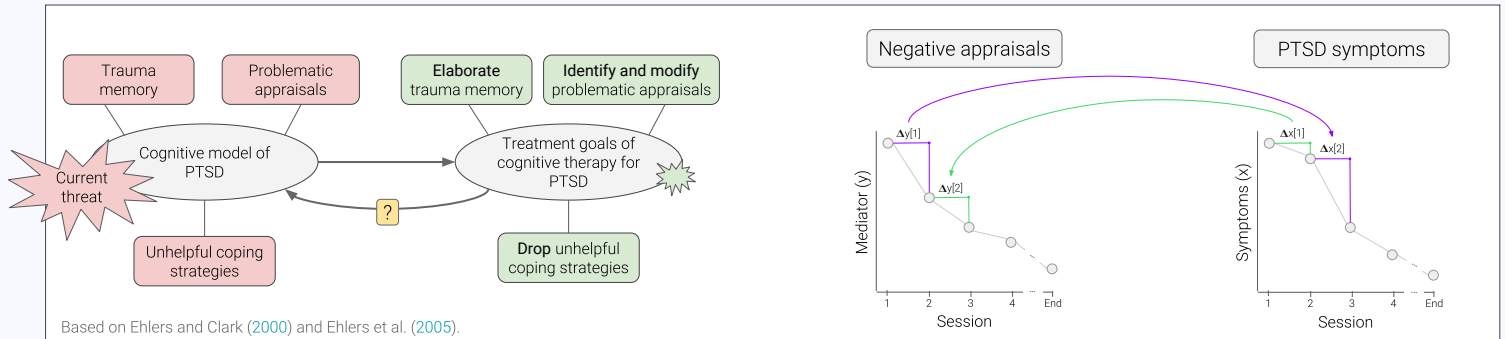


Tutorial on latent change score modeling in R: Combining the strengths of the packages lavaan, broom, and semPlot

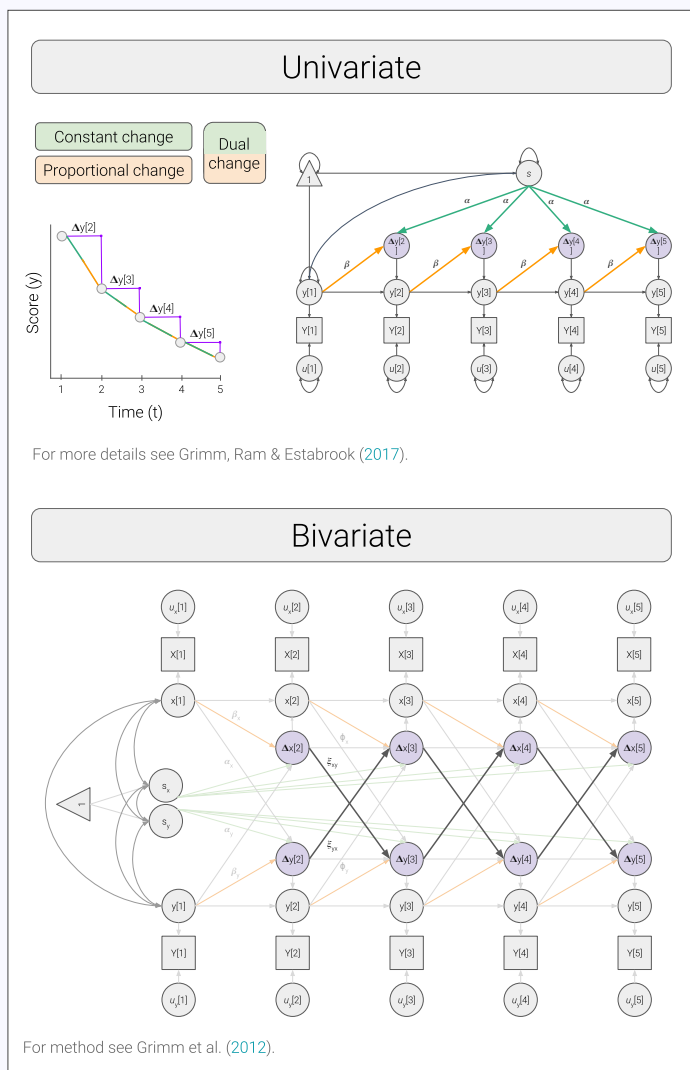
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Example: Investigating longitudinal mediation of treatment effects



Latent change score (LCS) modeling



Using R for LCS modeling

lavaan

Specify different LCS models using lavaan (Rosseel, 2012).

```
# Specify between-construct coupling parameters:  
# Change score y (t) is determined by change score x (t-1)  
dy2 ~ xi_yx * dx1  
dy3 ~ xi_yx * dx2  
# Change score x (t) is determined by change score y (t-1)  
dx2 ~ xi_xy * dy1  
dx3 ~ xi_xy * dy2
```

broom

Extract fit statistics and parameter estimates of lavaan objects using broom (Robinson & Hayes, 2018).

lavaan
object

tidy()
glance()

Estimated parameters

Fit statistics

semPlot

Plot simplified path diagrams of LCS models using semPlot (Epskamp & Stuber, 2017).

lavaan
object

+

layout
matrix

=



lcstools

Tools to combine the strengths of different R packages for specifying, analysing, and visualising latent change score models (Wiedemann, 2019). 

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, 38(4), 319–345.
Ehlers, A., Clark, D. M., Hackmann, A., McManus, F., & Fennell, M. J. V. (2005). Cognitive therapy for post-traumatic stress disorder: Development and evaluation. *Behaviour Research and Therapy*, 43(4), 413–431.

Grimm, K. J., An, Y., McArdle, J. J., Zonderman, A. B., & Resnick, S. M. (2012). Recent changes leading to subsequent changes: Extensions of multivariate latent difference score models. *Structural Equation Modeling*, 19(2), 268–292.
Grimm, K. J., Ram, N., & Estabrook, R. (2017). *Growth Modeling - Structural Equation and Multilevel Modeling Approaches*. New York: The Guilford Press. 