

# Modeling Psychopathology: From Data Models to Formal Theories

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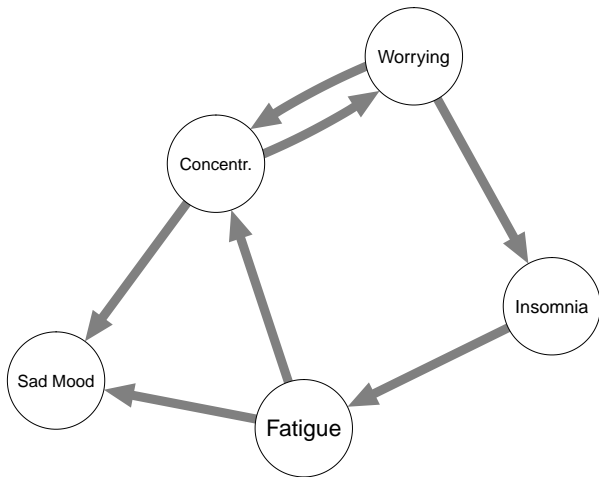
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*University of Amsterdam*

*\*Joint first authors*

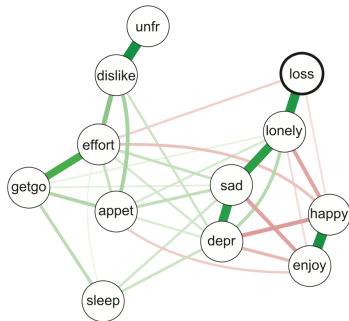
2021 APS Virtual Convention

# Network Approach to Psychopathology

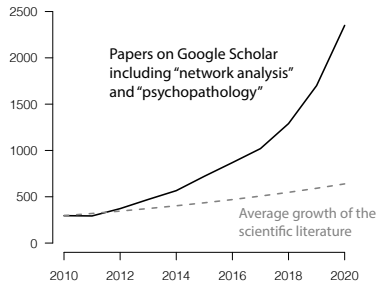


(Cramer et al, 2010; Borsboom et al. 2013; Schmittman et al, 2013; Borsboom, 2017)






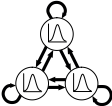


# Statistical Network Analysis



(Figure from Fried et al., 2015)

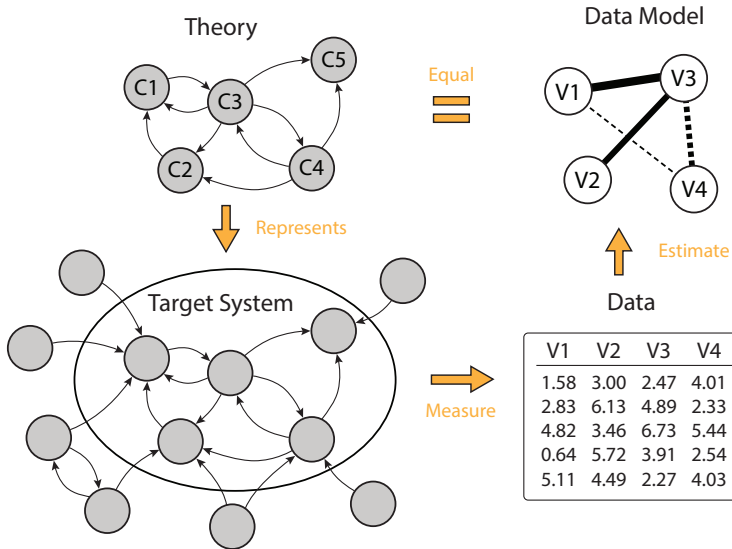


# Statistical Network Models as Theories?

		Feedback Loops	Asymmetric Relationships	Different Time Scales	Higher-order Interactions	Multiple Stable States
						
VAR Model		✓	✓	✗	✗	✗
GGM		✓	✗	✗	✗	✗
Ising Model		✓	✗	✗	✗	✓

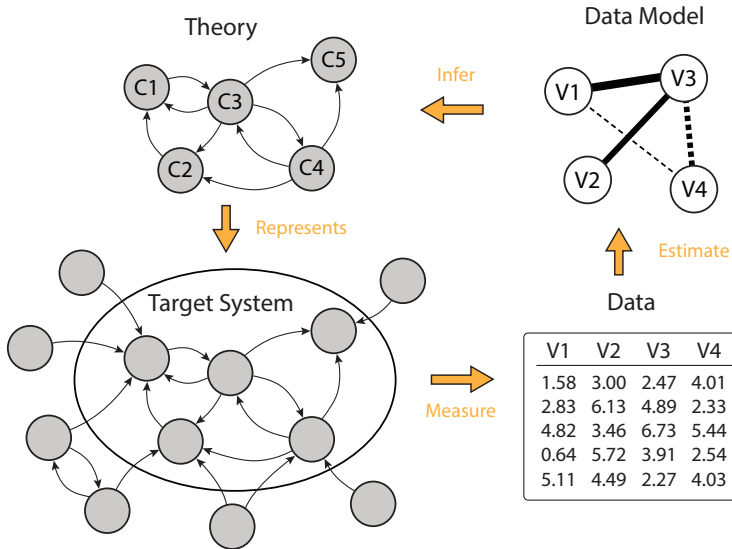
(Haslbeck\*, Ryan\*, Robinaugh\*, et al., accepted)

# Target systems, Theories, Data and Data Models



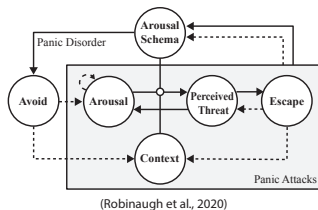
(Haslbeck\*, Ryan\*, Robinaugh\*, et al., accepted)

# Target systems, Theories, Data and Data Models

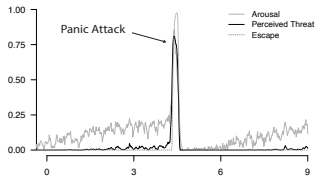


(Haslbeck\*, Ryan\*, Robinaugh\*, et al., accepted)

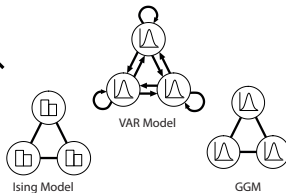
# Infer Theories from Data Models?



Generate



Try to infer  
true formal theory

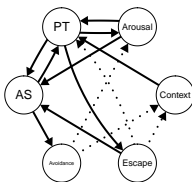


Estimate

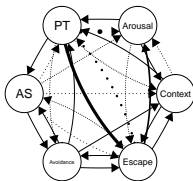
(Robinaugh et al., 2020; Haslbeck\*, Ryan\*, Robinaugh\*, et al., accepted)

# Infer Theories from Data Models?

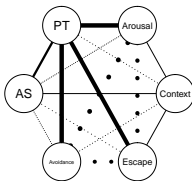
(a) True Local Dependence



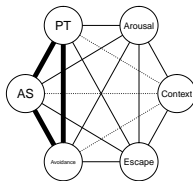
(b) VAR Model



(c) Gaussian Graphical Model



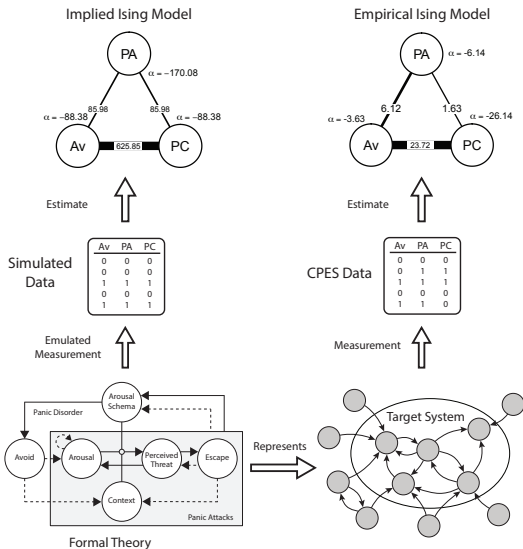
(d) Ising Model



(Haslbeck\*, Ryan\*, Robinaugh\*, et al., accepted)



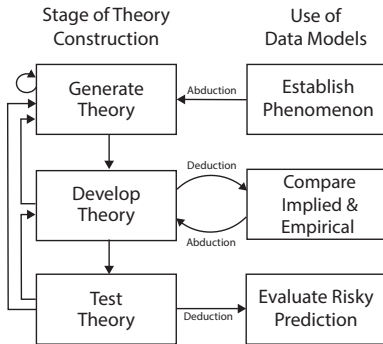
# Alternative: Abductive Theory Construction



(Haslbeck\*, Ryan\*, Robinaugh\*, et al., accepted)

# From Data Models to Formal Theories

- ▶ Data models are unlikely to be good theories
- ▶ Naive inferences from data models to theories are highly problematic
- ▶ Abductive theory construction may be a powerful way forward



Haslbeck J. M. B.\*, Ryan O.\*, Robinaugh D. J.\*, Waldorp L. J., & Borsboom D. (accepted). Modeling Psychopathology: From Data Models to Formal Theories. *Psychological Methods*. PsyArXiv: <https://psyarxiv.com/jgm7f>