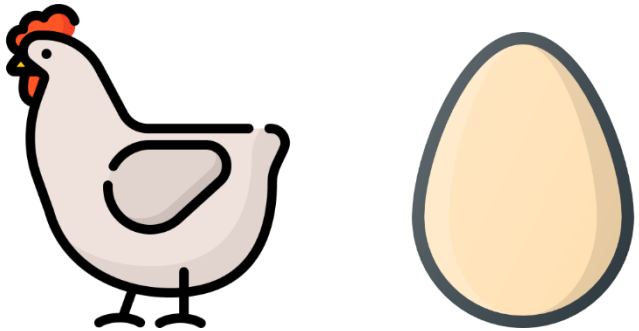
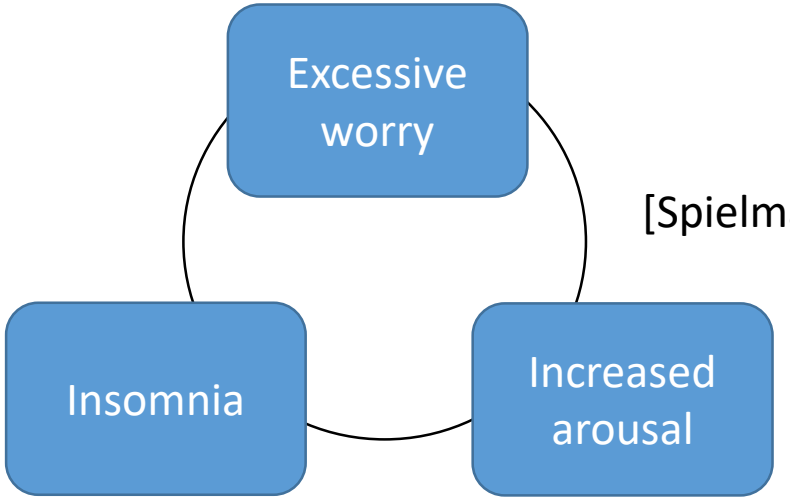
Variability in symptom networks across sleep disorders (a quick tutorial)

Vincent P. MARTIN, PhD

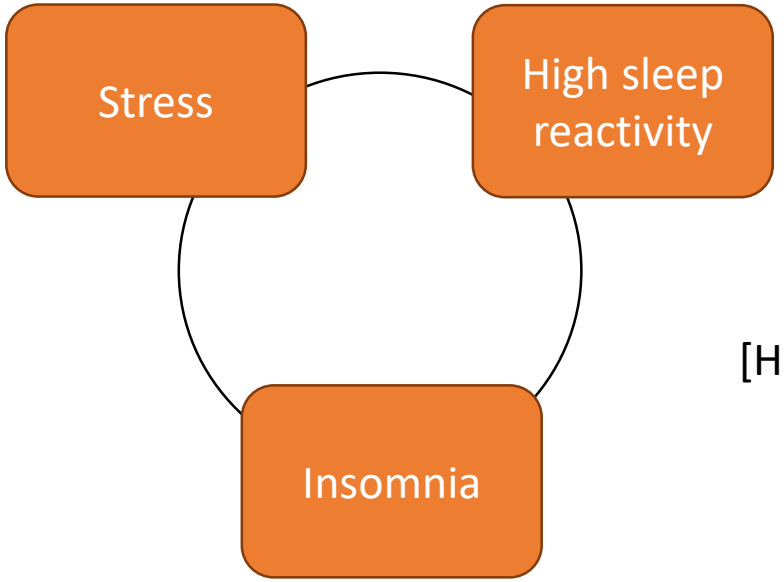
International Seminar MIAI : Variability in sleep: Impact for diagnosis of sleep disorders and outcomes prediction

1) Complex relationships





[Spielman 1987]



[Harvey 2002]

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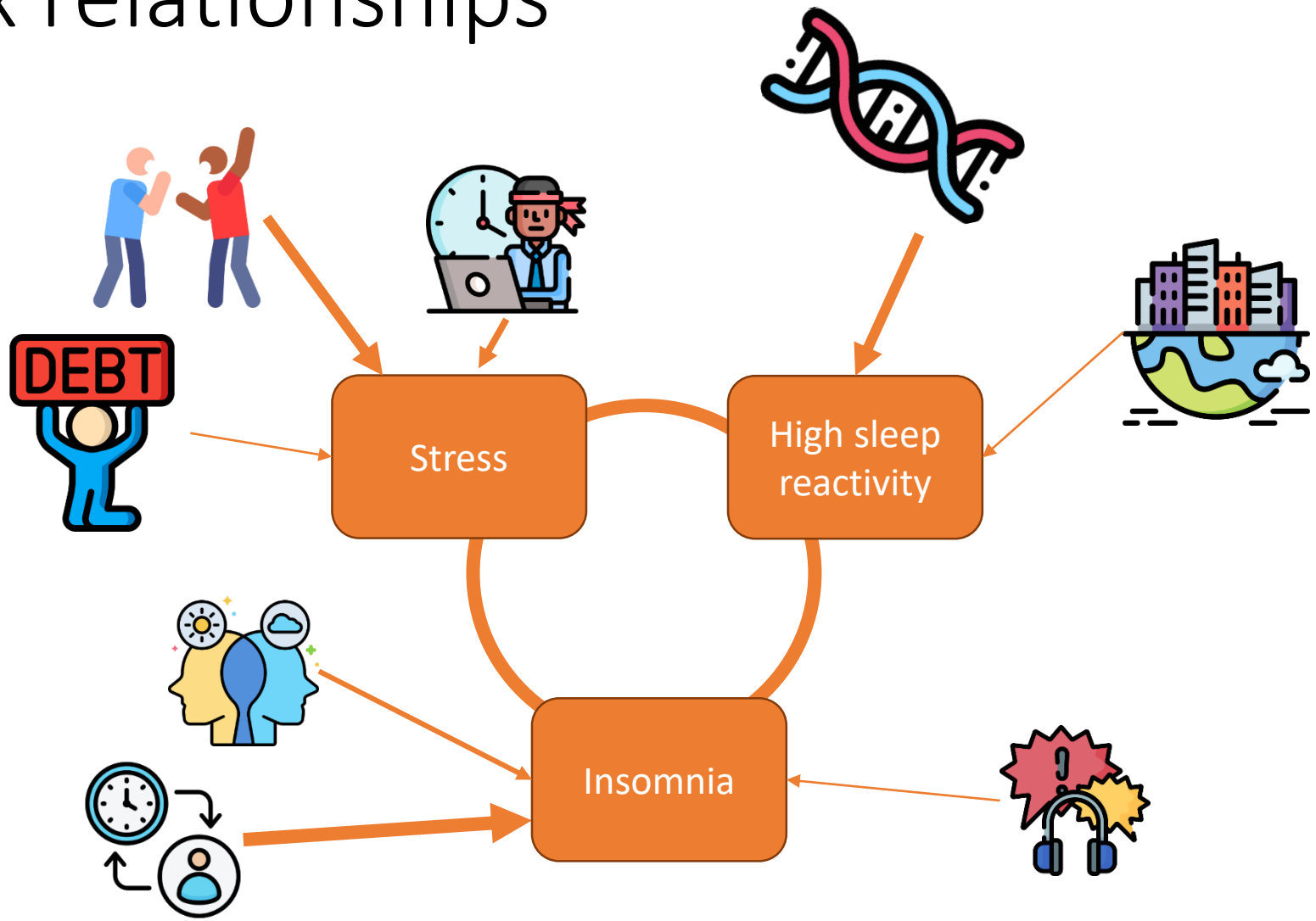

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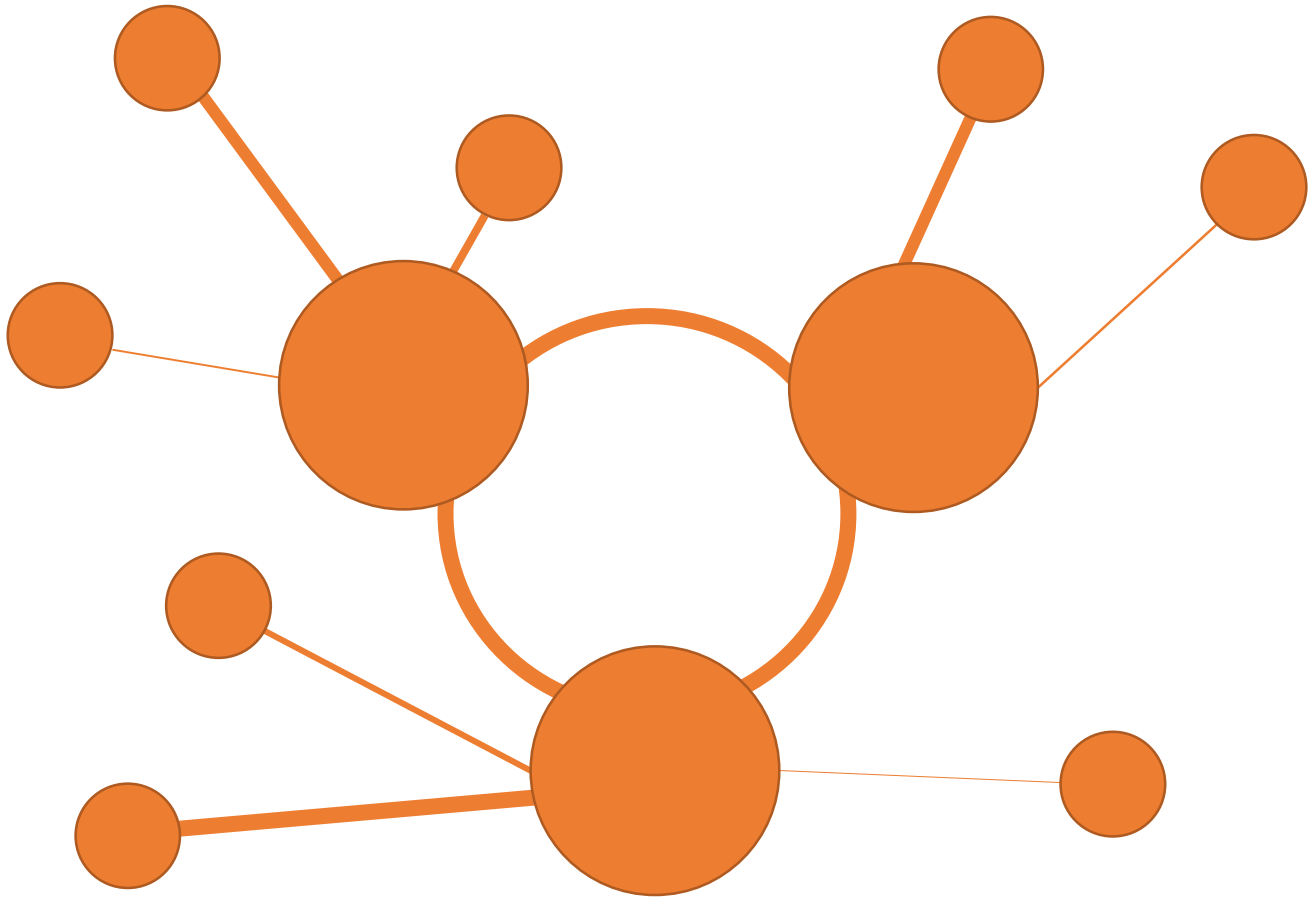
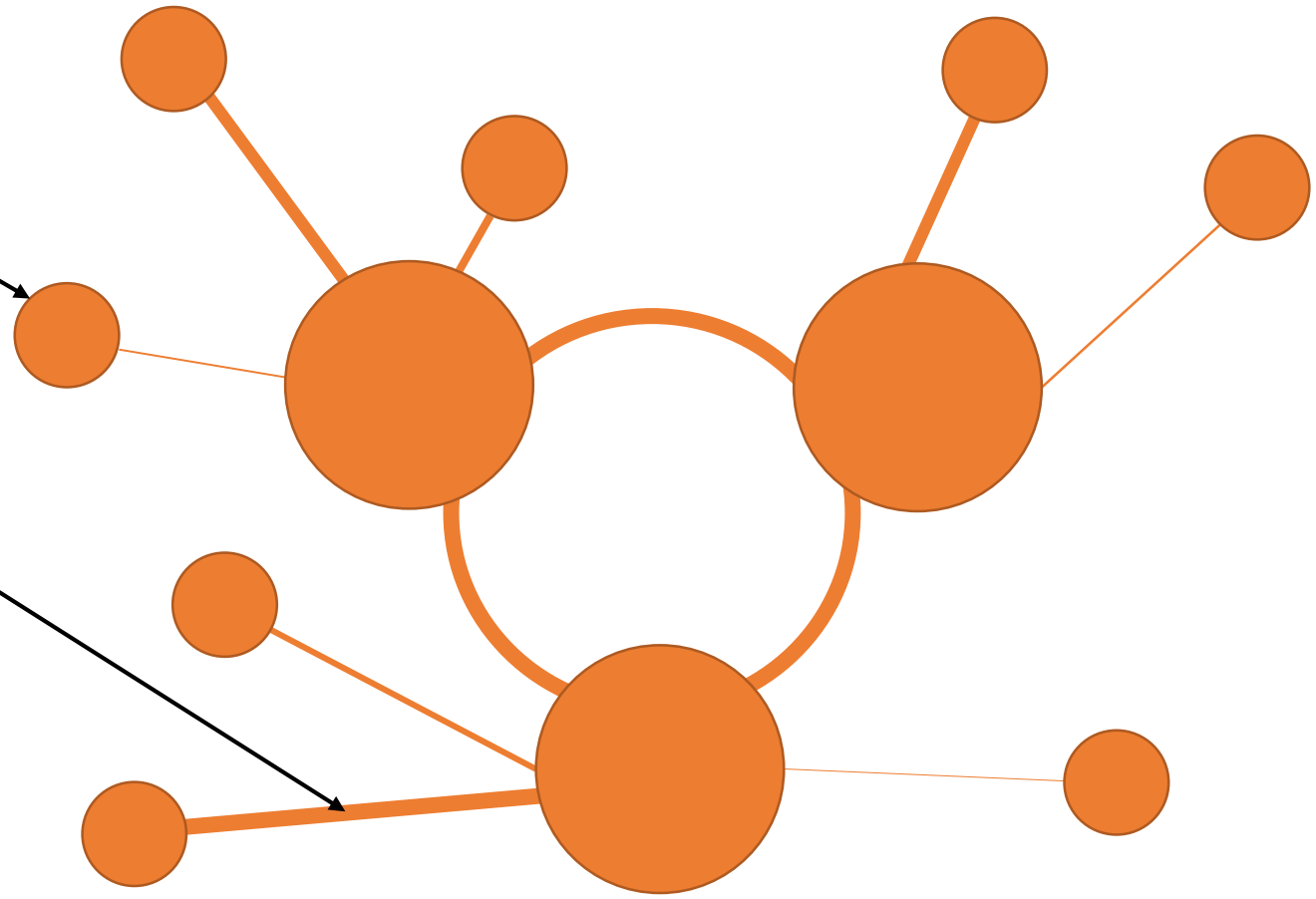


2) Network analysis

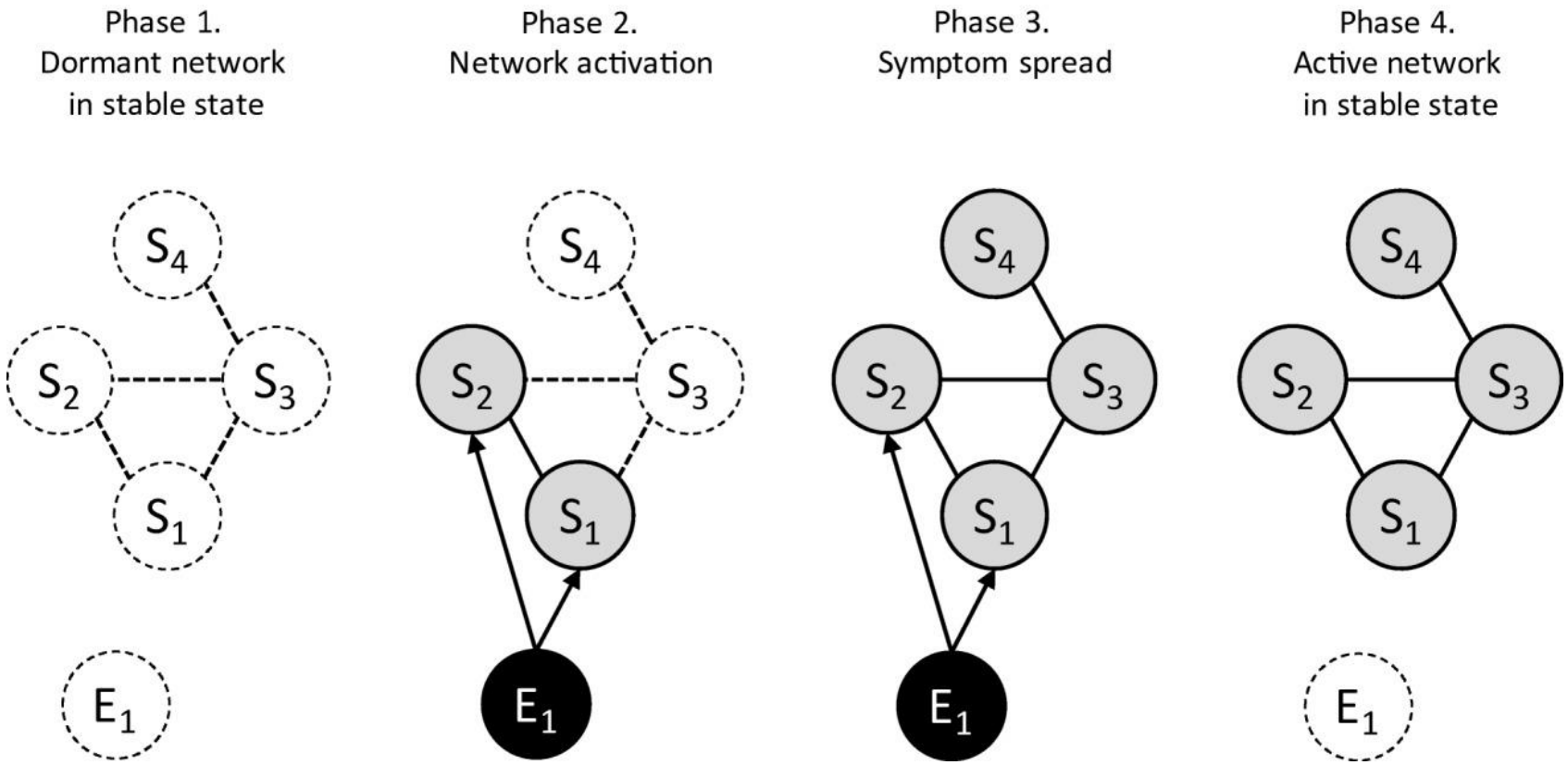
Node = clinical manifestation
- GGM (« continuous »)
- Ising (binary)

Edge = relation between them
- Spearman correlation
- Polychoric correlation



2) Network analysis

[Borsboom 2017]



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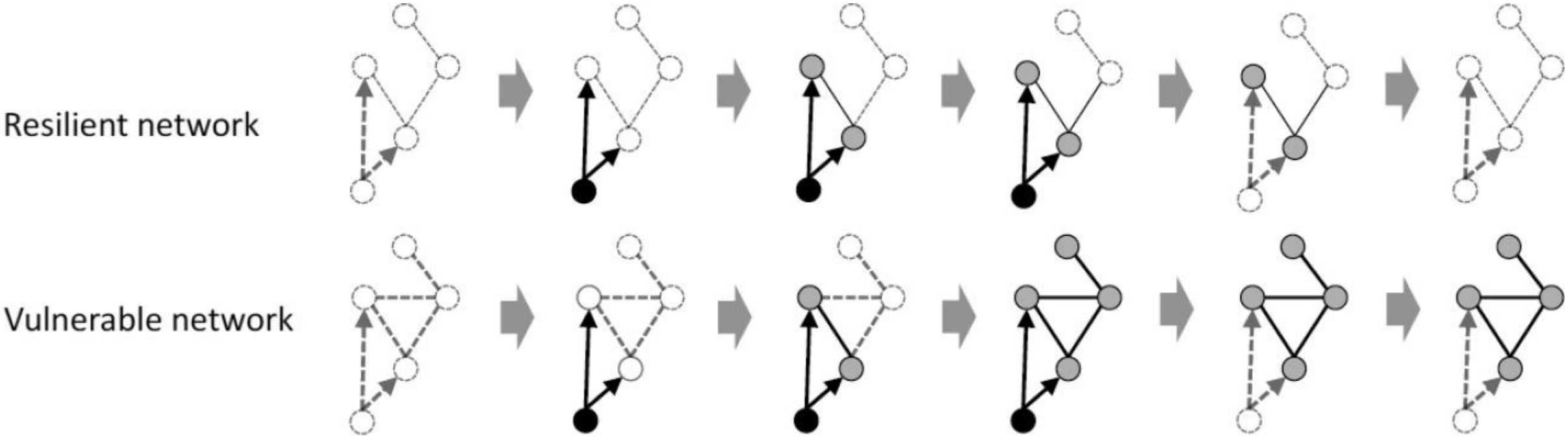
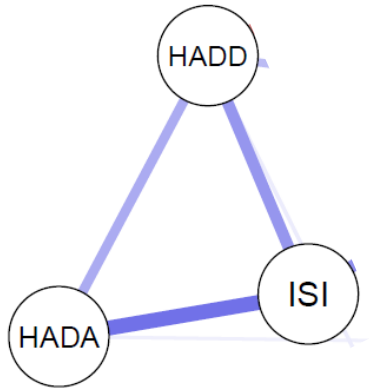


→ Clinical outcome n°1: vulnerability

2) Network analysis

N = 136
Bordeaux Sleep Clinics
Diversity of sleep disorders

- Anxiety and Depression: HAD
- Insomnia: ISI



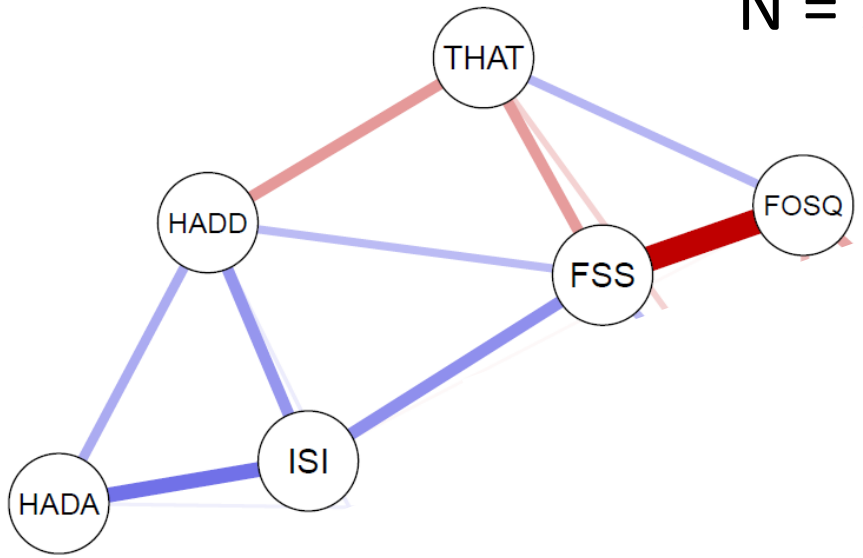
Martin et al., in preparation

qgraph

2) Network analysis

- Anxiety and Depression: HAD
- Insomnia: ISI
- Alertness: THAT
- Functional level: FOSQ
- FSS: Fatigue

N = 136



Martin et al., in preparation

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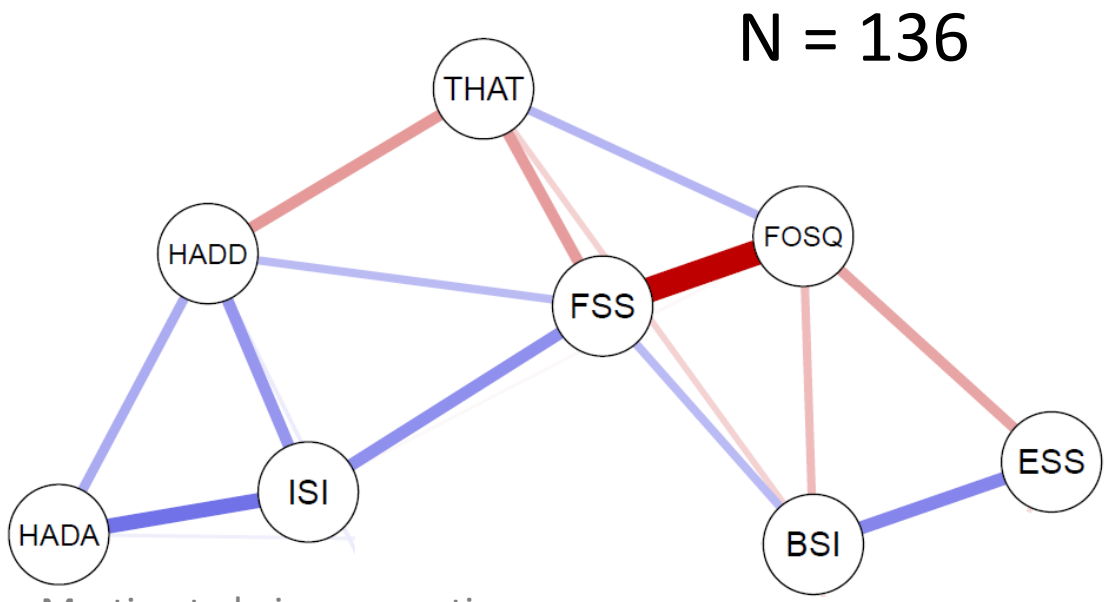
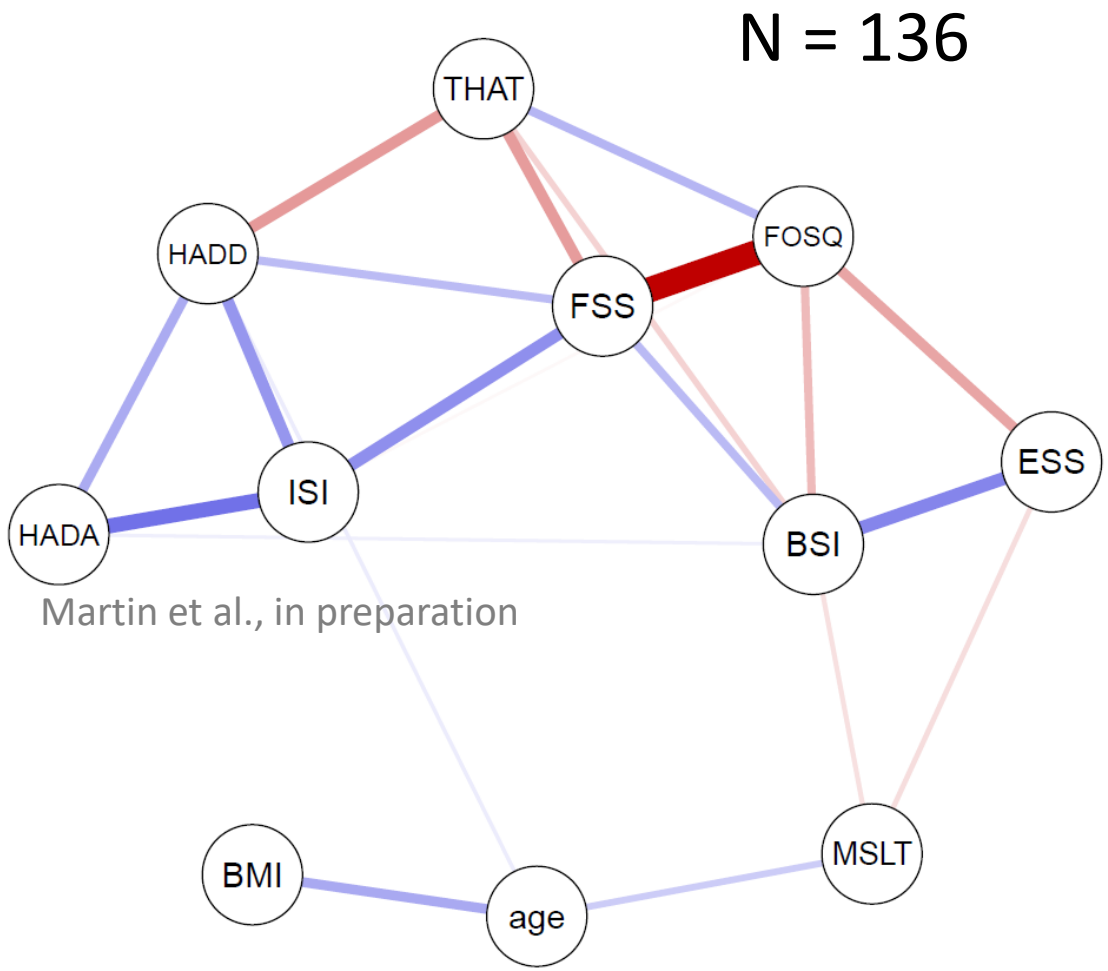


Martin et al., in preparation

qgraph

2) Network analysis

- Anxiety and Depression: HAD
- Insomnia: ISI
- Alertness: THAT
- Functional level: FOSQ
- FSS: Fatigue
- Sleepiness: ESS, BSI
- Sleep propensity (MSLT)

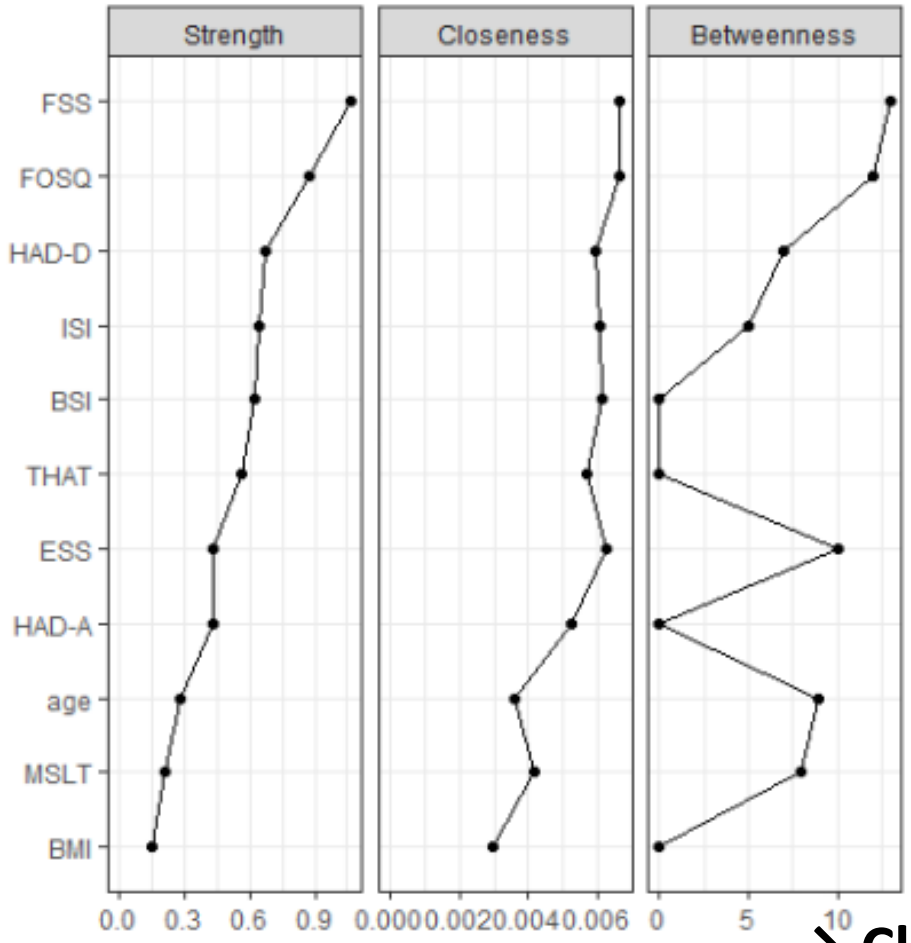


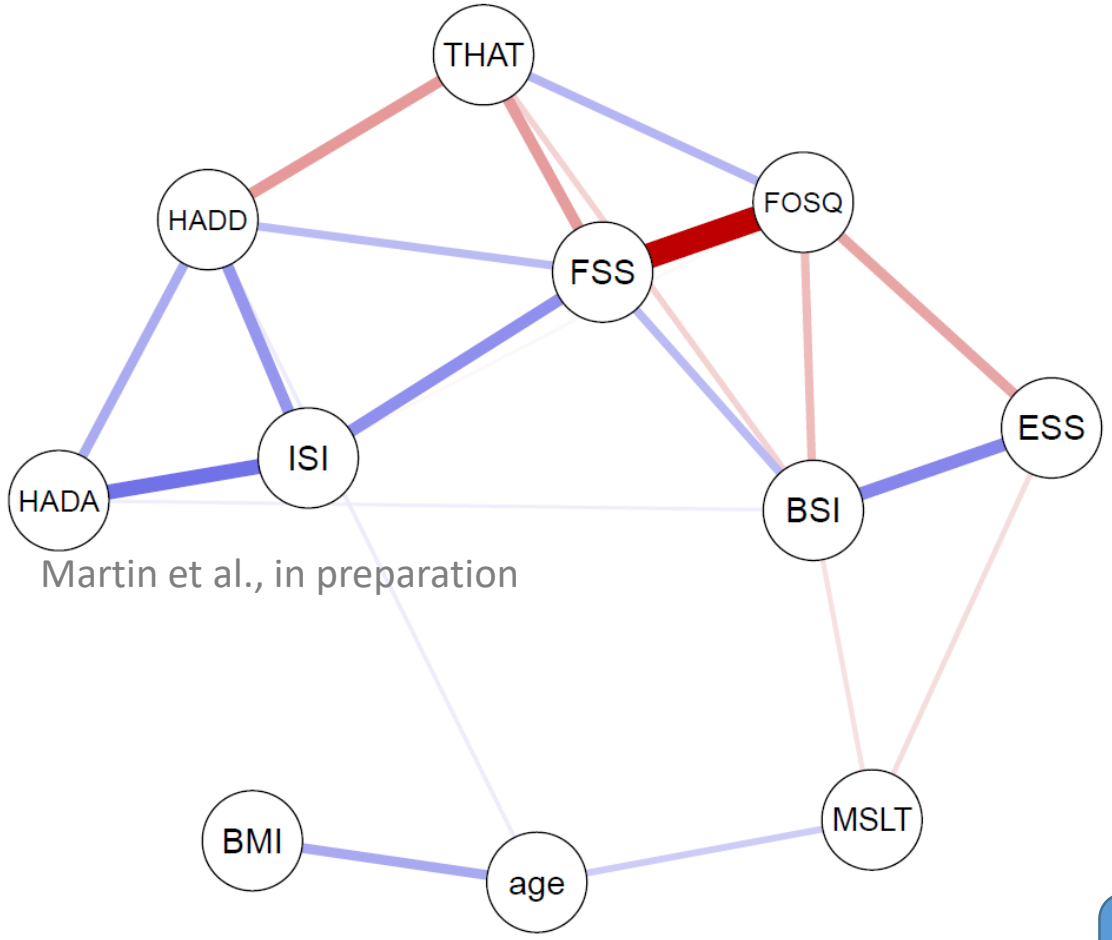
Martin et al., in preparation

qgraph

2) Network analysis

How many times the node is the shortest path ?





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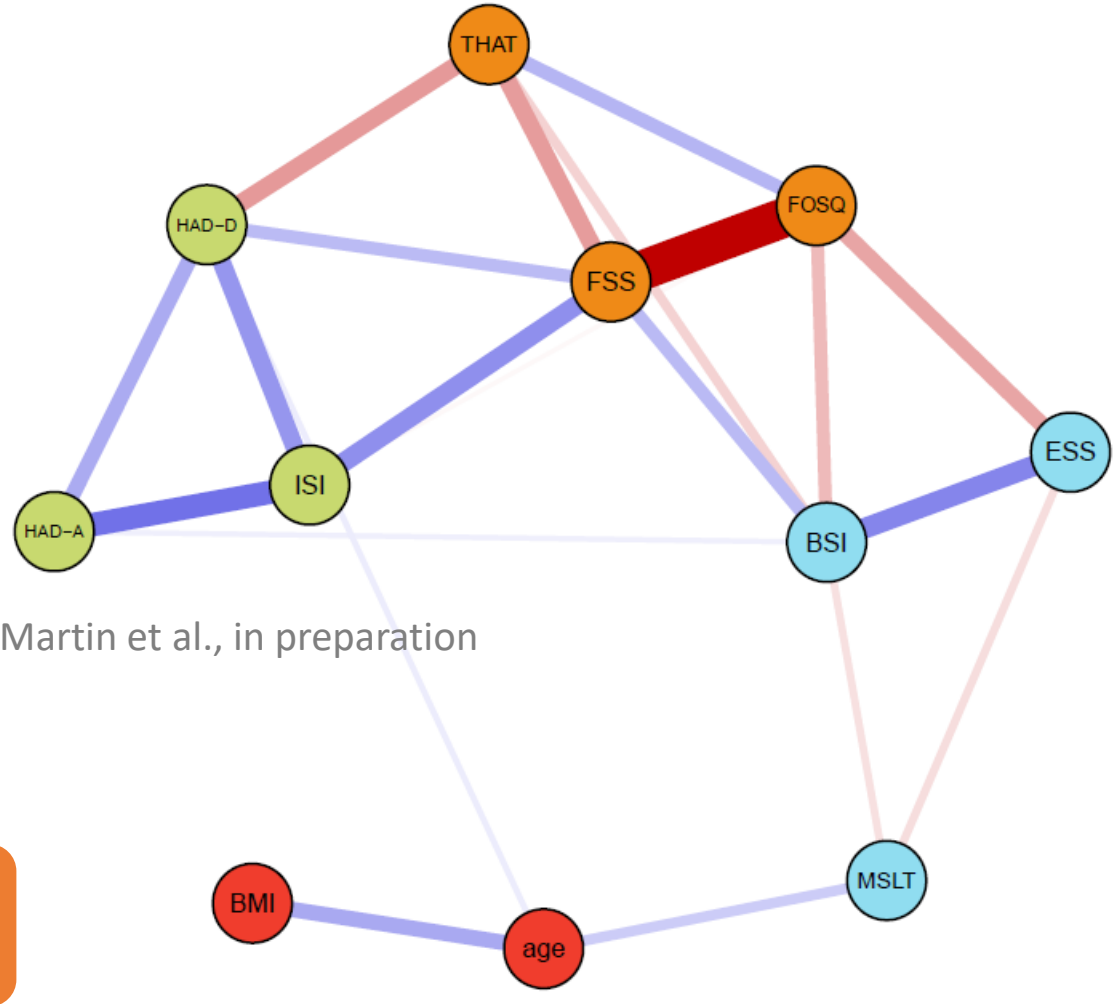
→ Clinical outcome n°2: centrality

bootnet

2) Network analysis

Louvain clustering algorithm
Bootstrap n=1000



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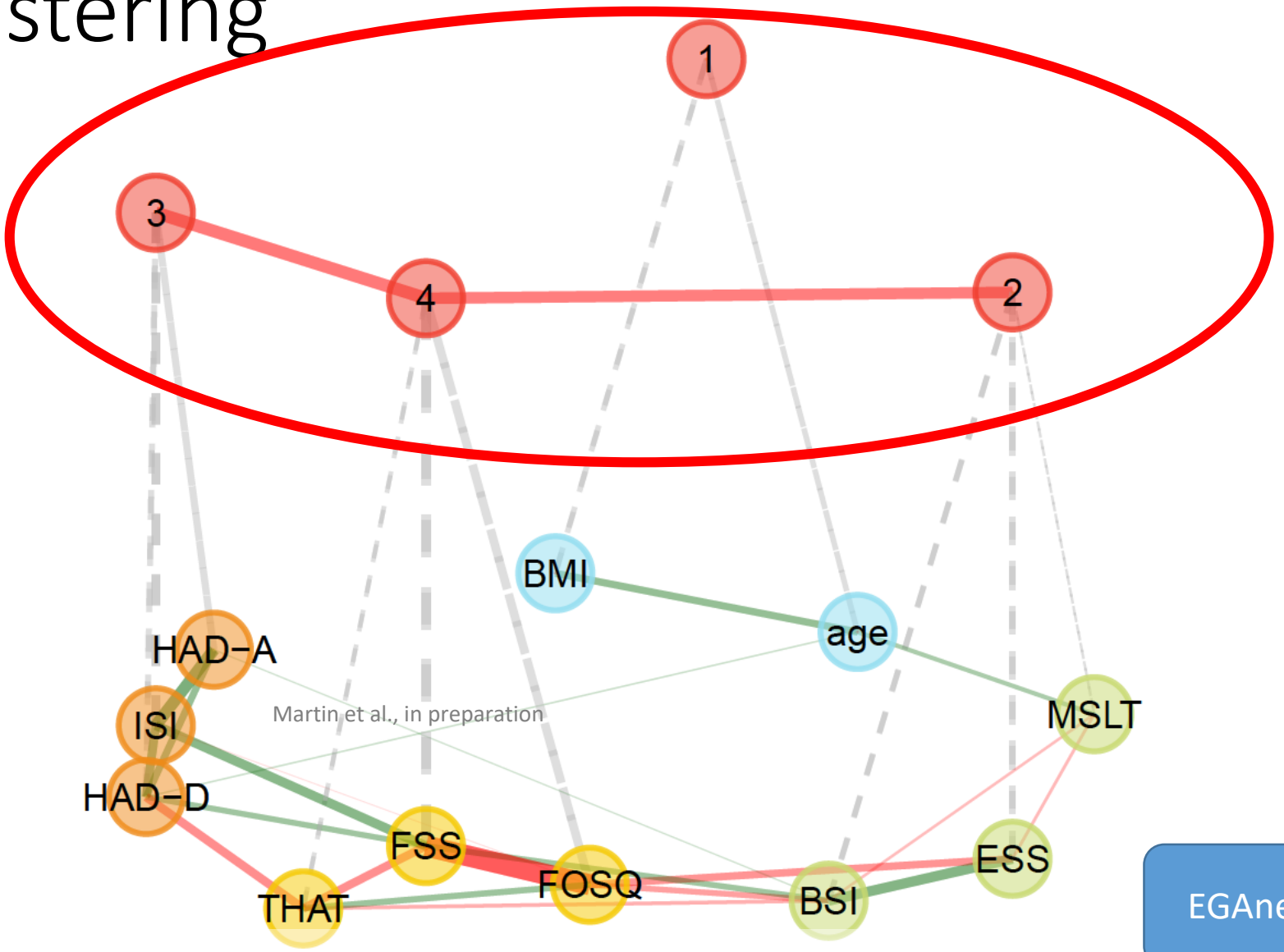
- 1. Covariates
- 2. Sleepiness
- 3. Insomnia and anxiety
- 4. Impact

SYMPTOMS

EGAnet

3) Hierarchical clustering

SYNDROMES



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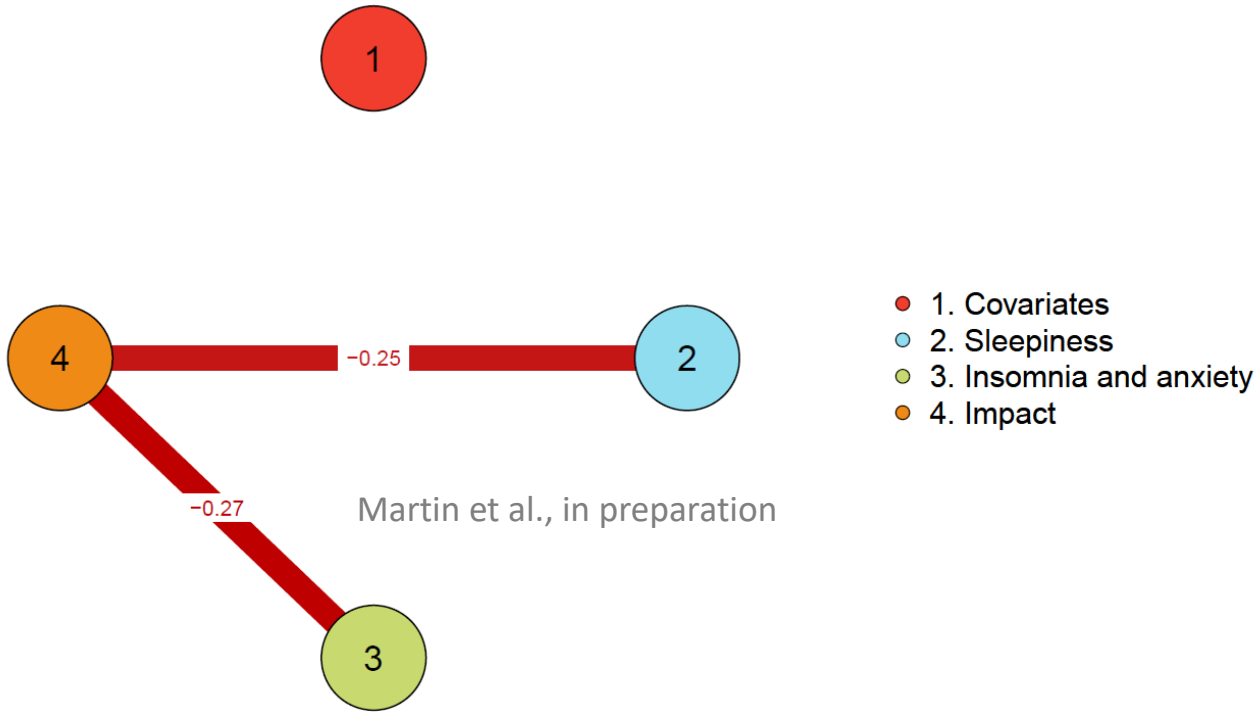
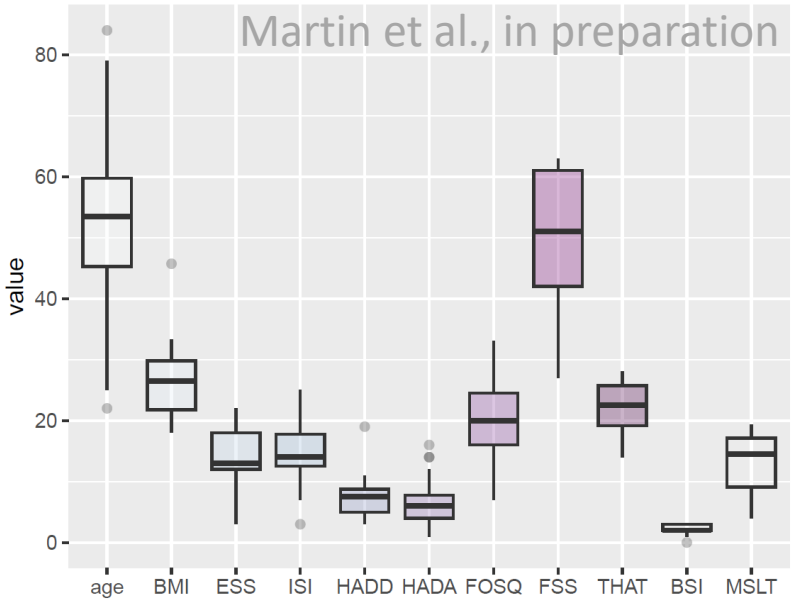


Martin et al., in preparation

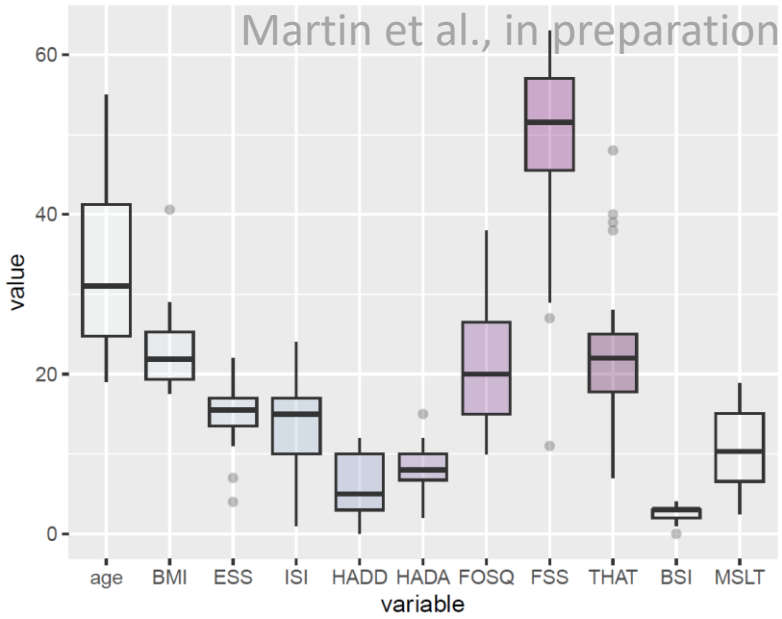
qgraph

4) Comparison between disorders

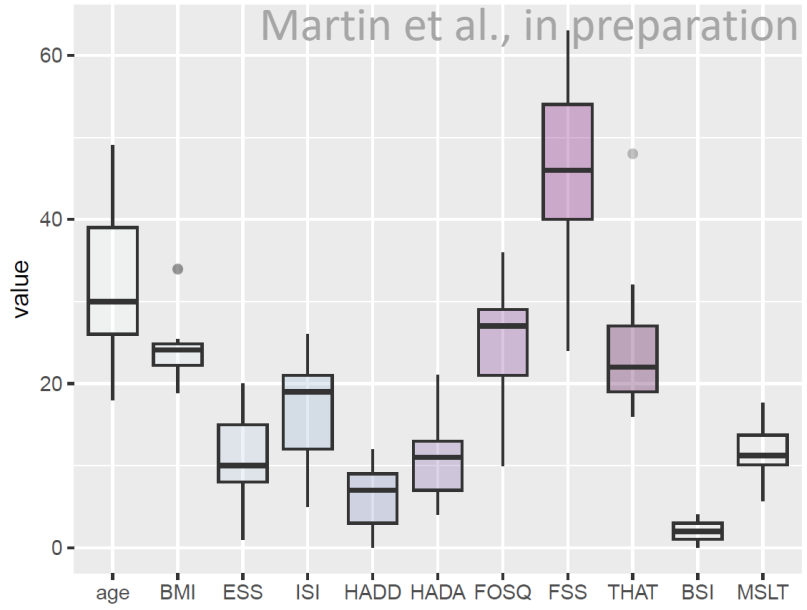
OSAS (n=18)



Idiopathic hypersomnia (n=28)



ADHD (n=21)



SYMPTOMS

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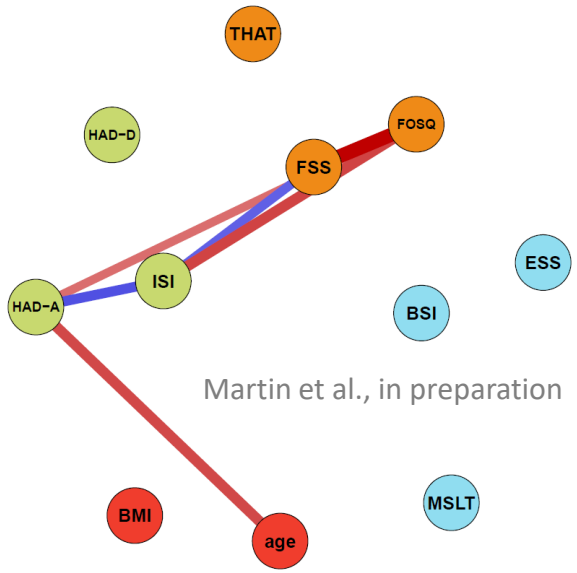

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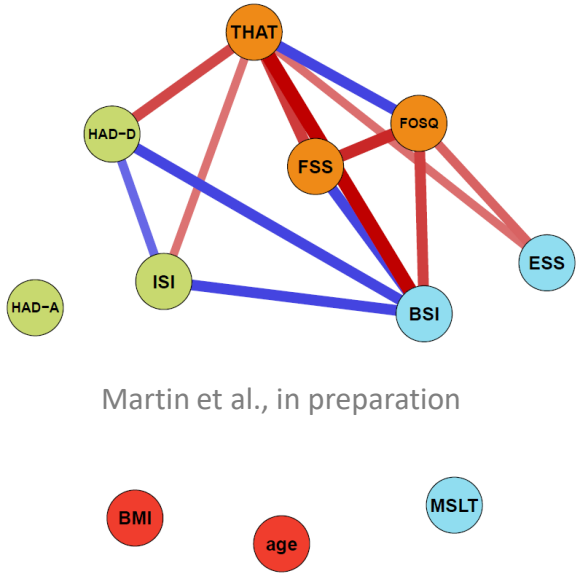

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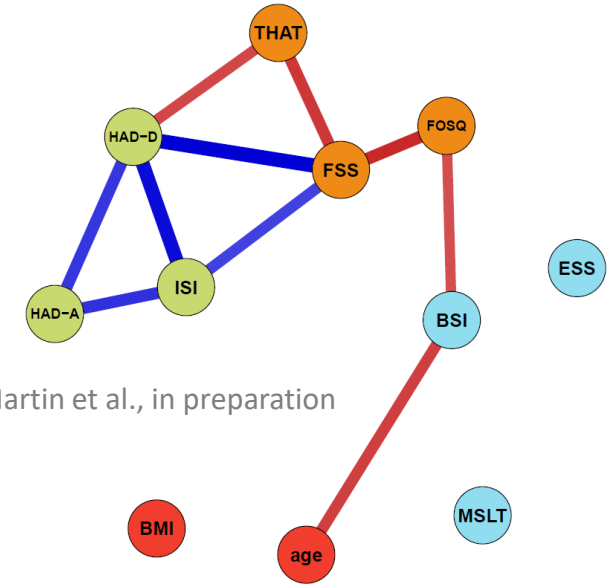

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SYMPTOMS

NetworkComparisonTest

4) Comparison between disorders

- 1. Covariates
- 2. Sleepiness
- 3. Insomnia and anxiety
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SYNDROMES

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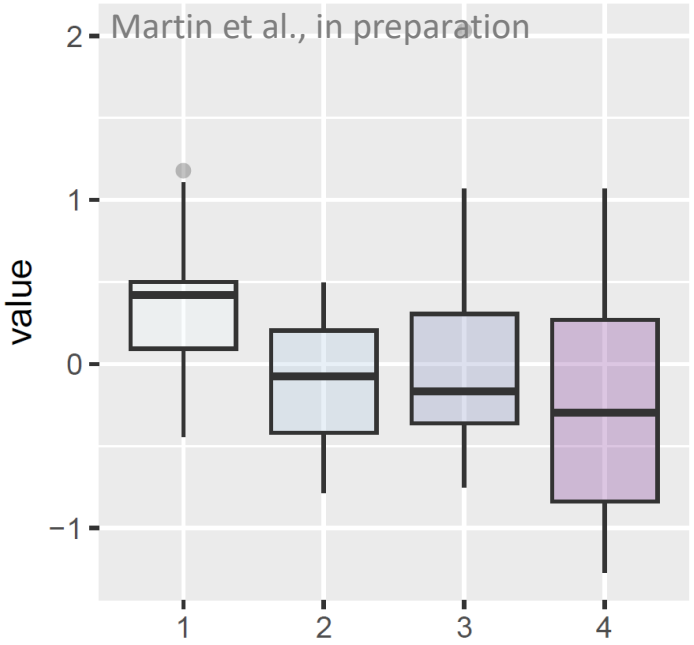

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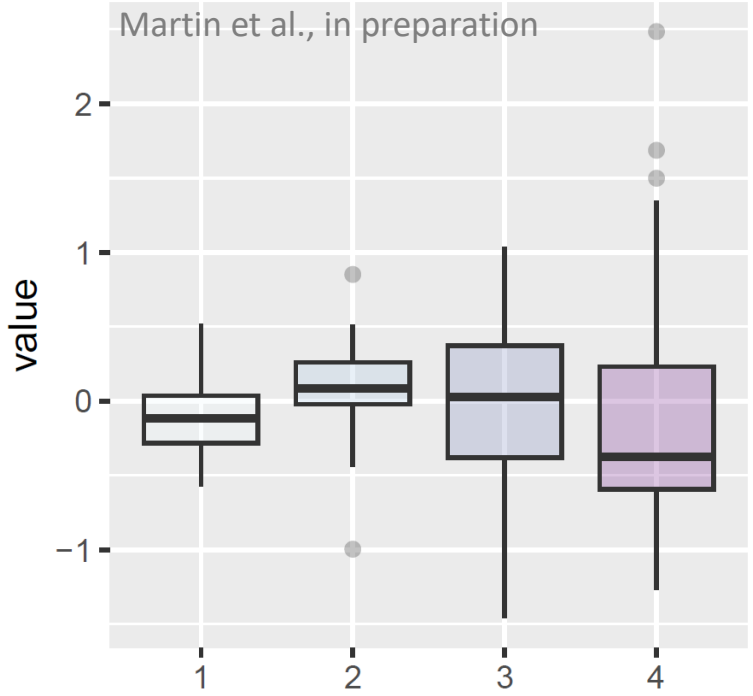

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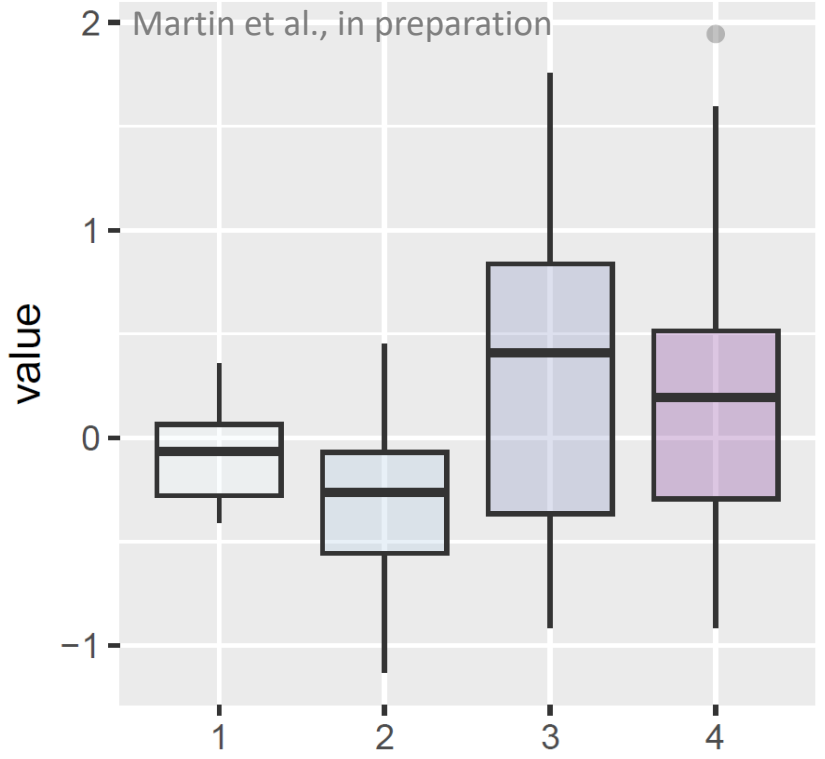

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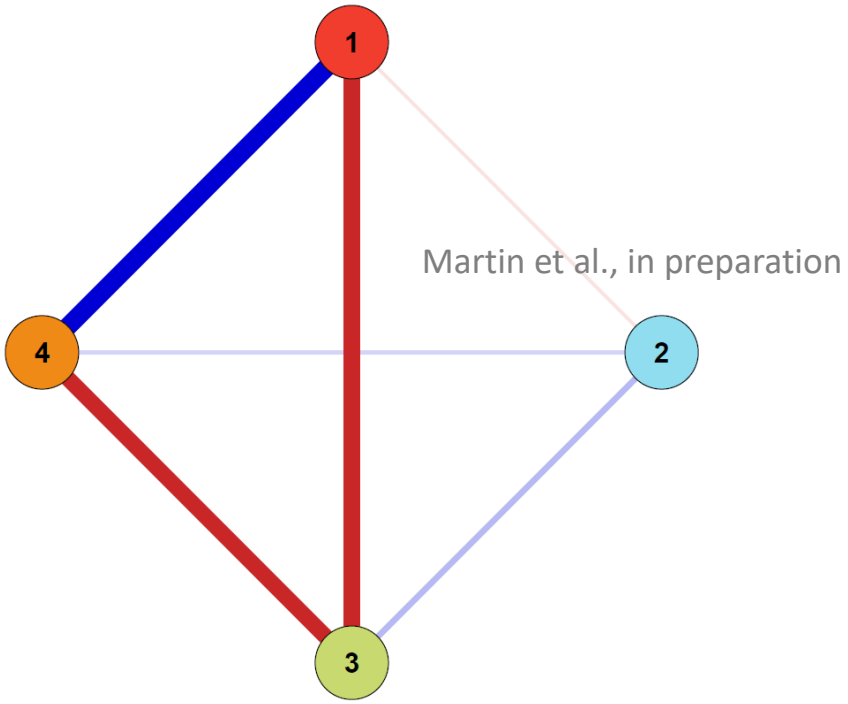

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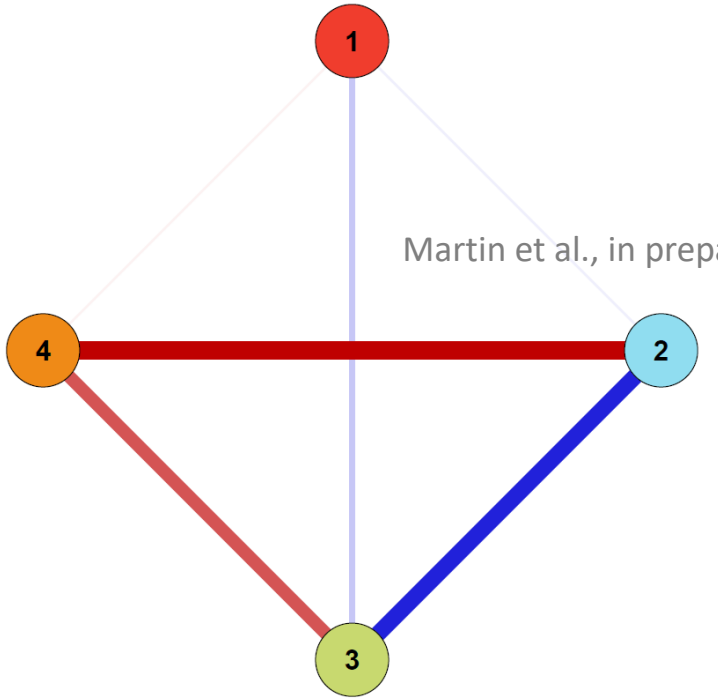

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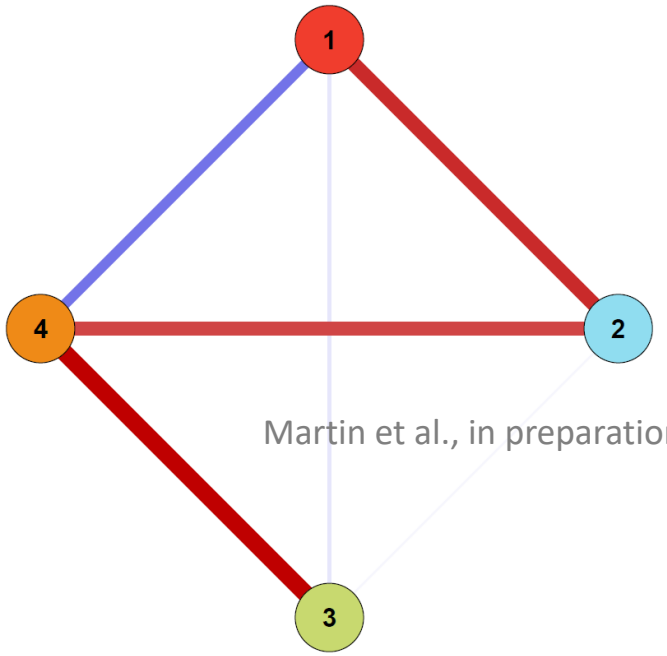
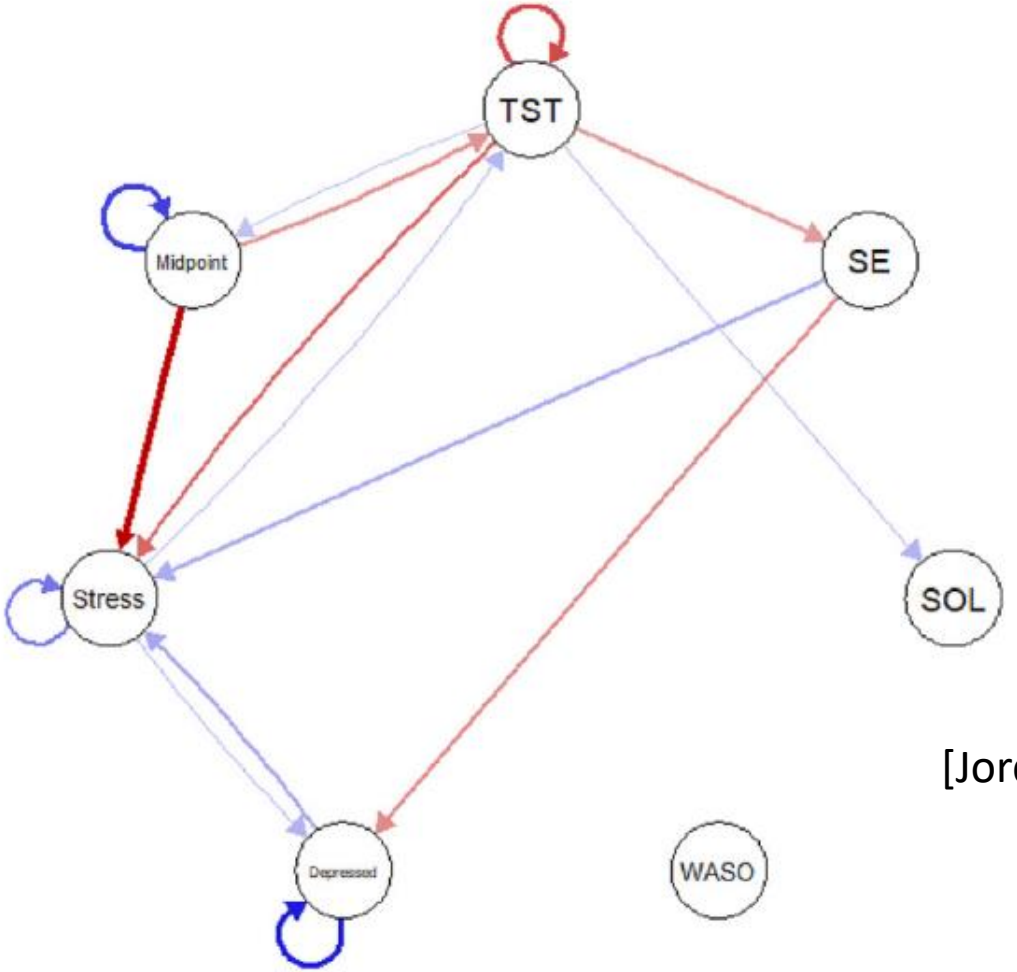


NetworkComparisonTest

What about temporal variations?

4) Temporal Network Analysis

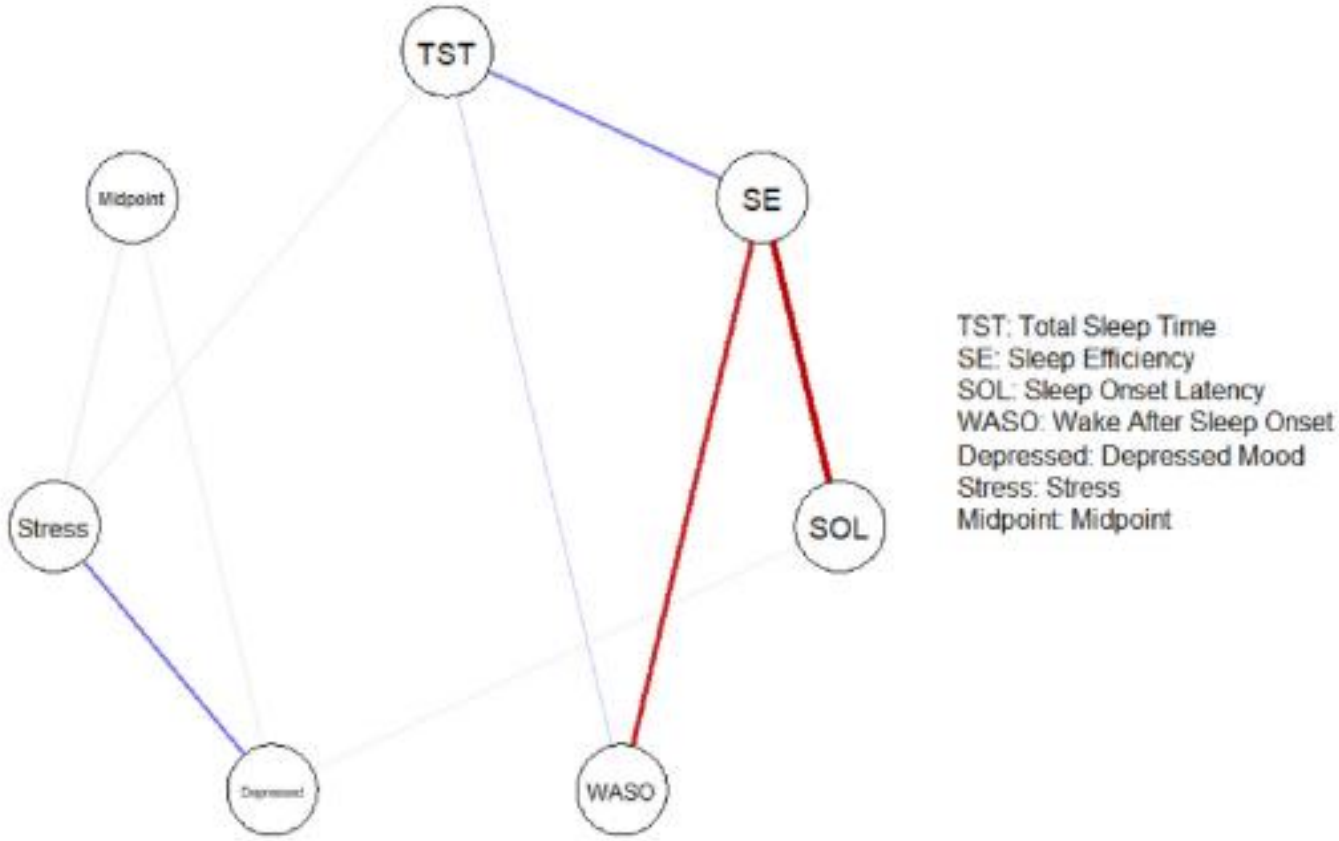
14 days
EMA
N=401 nurses



TST: Total Sleep Time
SE: Sleep Efficiency
SOL: Sleep Onset Latency
WASO: Wake After Sleep Onset
Depressed: Depressed Mood
Stress: Stress
Midpoint: Midpoint

[Jordan et al., 2023]

4) Contemporaneous Network Analysis



[Jordan et al., 2023]

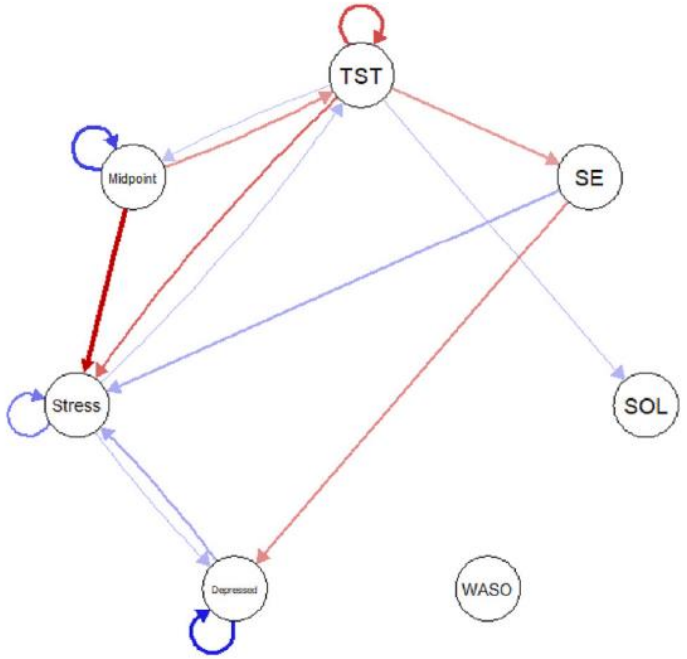
4) Limits

→ EMA: when does the data has been filled?
→ nurses: no clinical levels of insomnia, depression or anxiety levels

Table 1
Participant demographics (N = 401).

Measure	
Age (*M* (*SD*))	39.47 (11.14)
Gender (%)	
Male	32 (8.0)
Female	369 (92.0)
Marital Status (%)	
Married	253 (63.1)
Single	105 (26.2)
Divorced	33 (8.2)
Separated	7 (1.7)
Widowed	3 (0.7)
Race (%)	
White	312 (77.8)
African-American/Black	27 (6.7)
American Indian/Alaskan Native	6 (1.5)
Asian	42 (10.5)
Multiracial	7 (1.7)
Other	7 (1.7)
Ethnicity = Hispanic/Latinx (%)	43 (10.8)
Night Shift Worker (%)	106 (26.4)
Part-time Employment (%)	26 (6.5)
ISI Total (*M* (*SD*))	5.77 (4.50)
PHQ-9 Total (*M* (*SD*))	3.64 (3.97)
GAD-7 Total (*M* (*SD*))	2.80 (3.48)

Conclusion



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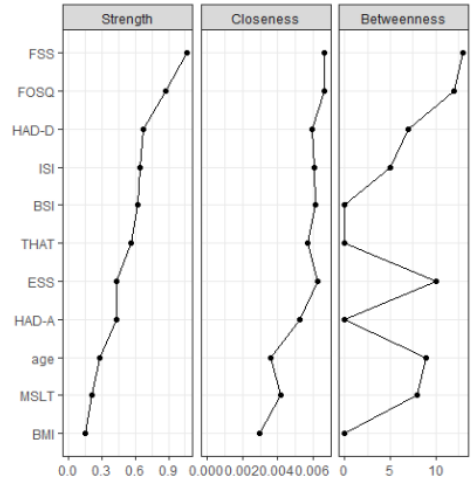
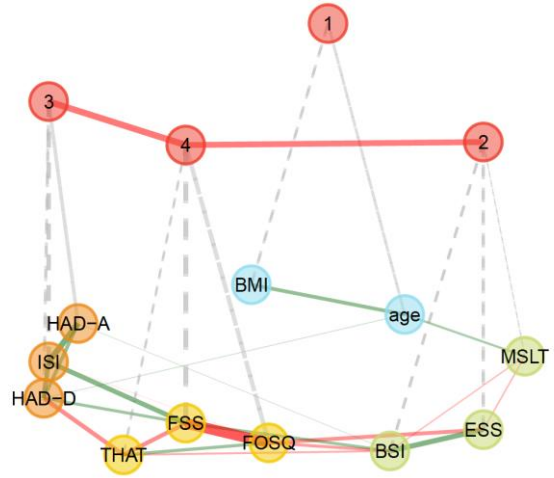
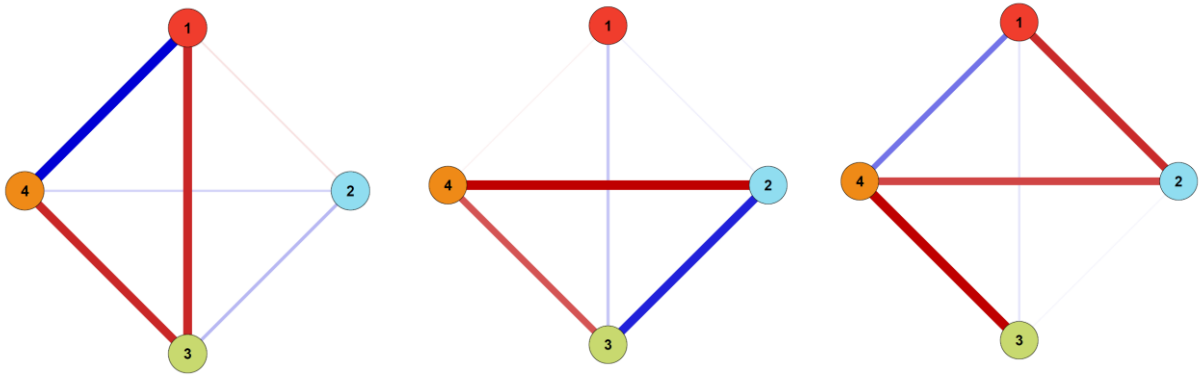
Temporal networks



Centrality



Symptom AND syndrome networks

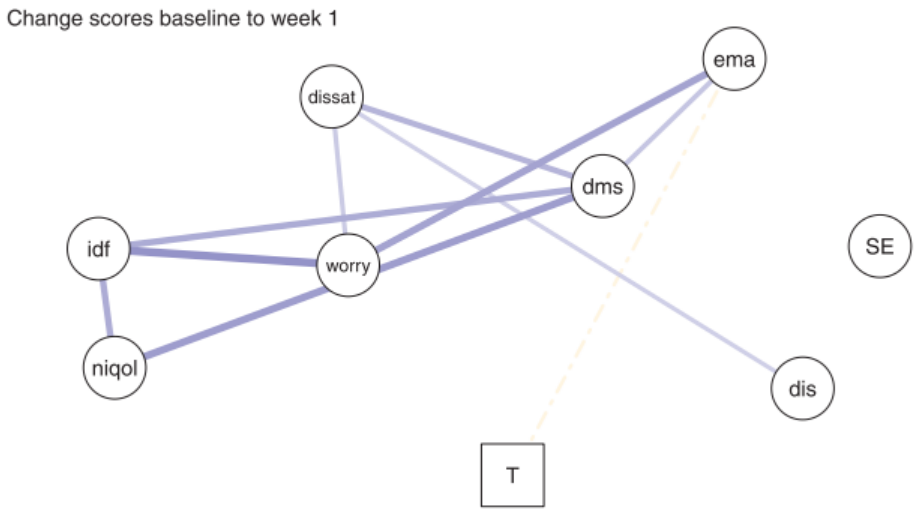


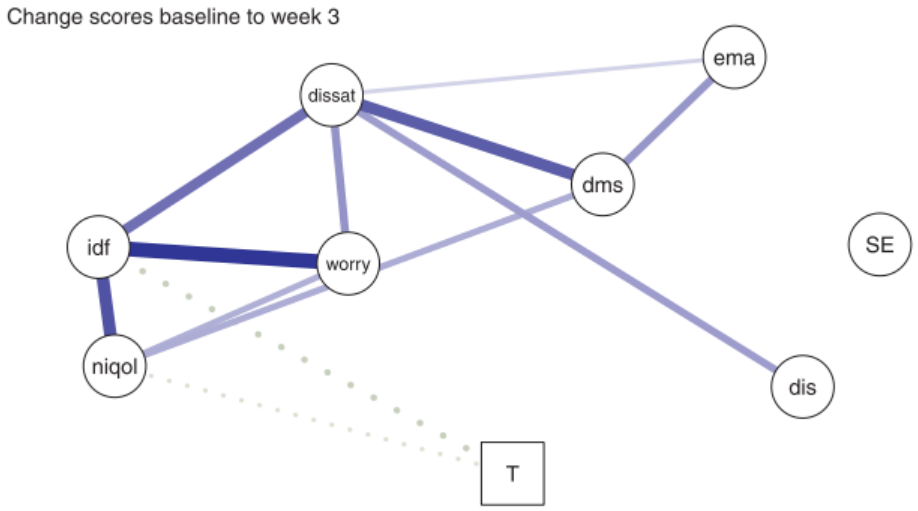
Stratification

5) Other related works

- Bruxism
- Insomnia and psy.
- Network intervention analysis

Tessa F. Blanken





6) What's next?

What variables to put into networks?

https://chart-studio.plotly.com/~vincent.martin/69

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