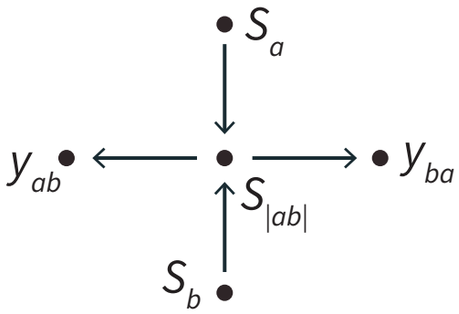
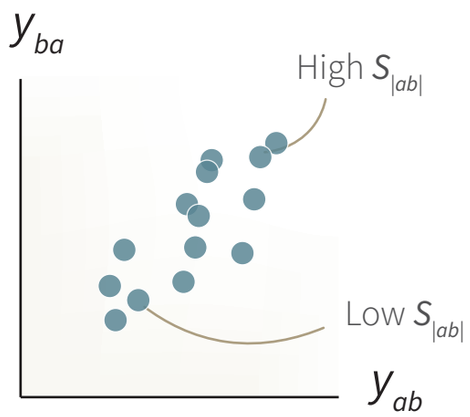
Causal process

A. Sampling effort

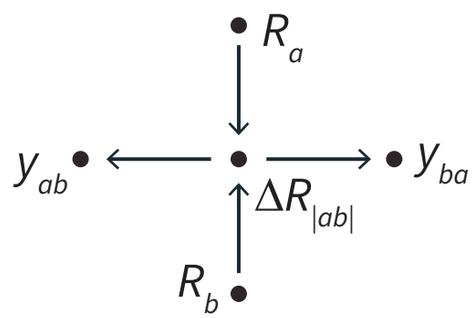


Statistical pattern

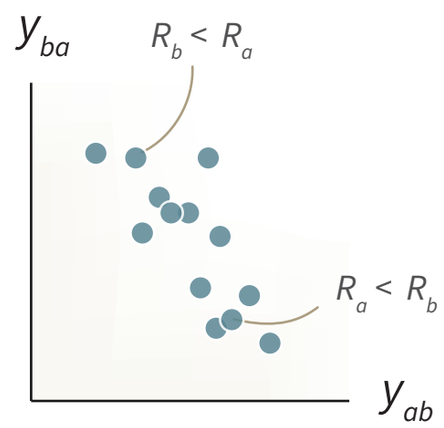


Causal process

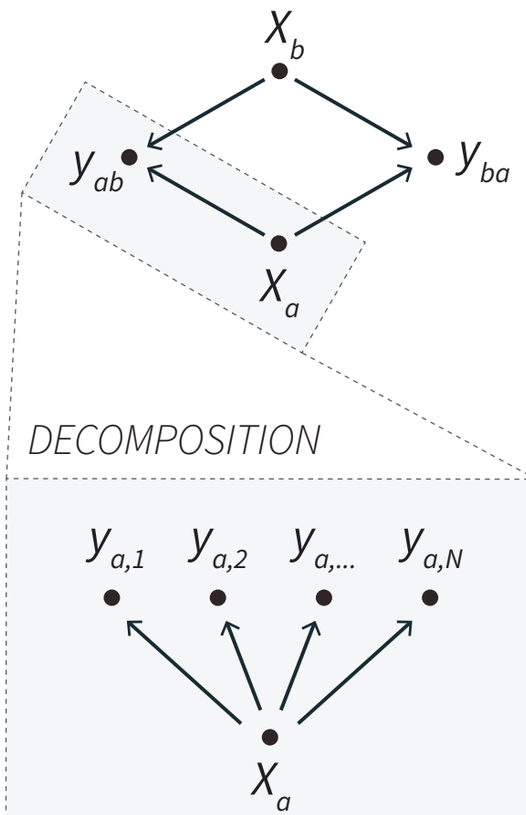
C. Dyad features (*e.g.*, dominance)

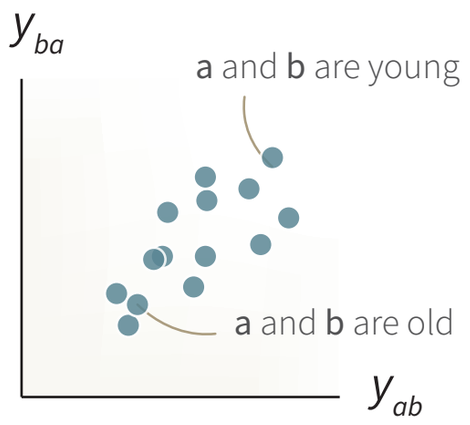


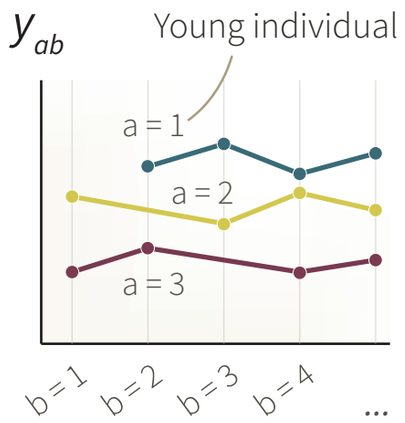
Statistical pattern



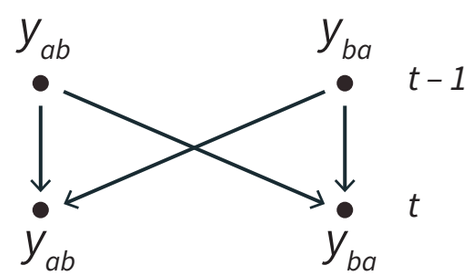
B. Individual features (*e.g.*, age)

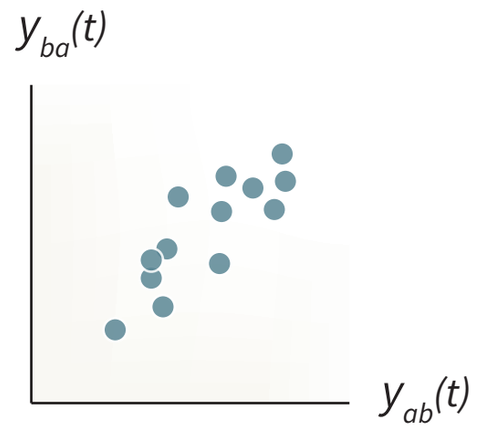




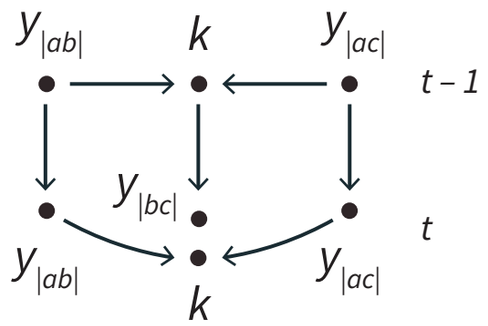


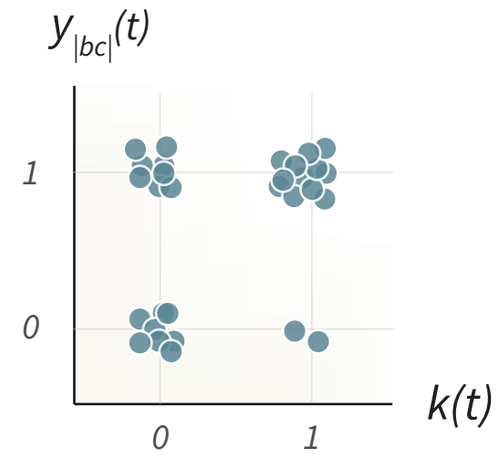
D. Dyadic reciprocity





E. Triadic closure





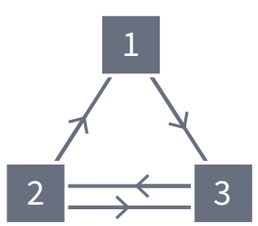
Causal diagram

Causal assumptions

The *variable* X influences the *variable* Y

Social network

Social interactions among N = 3 individuals



Squares represent *individual* animals

a	b	y_{ab}	y_{ba}	X_a	X_b
1	2	0	1	2.1	4.8
1	3	1	0	2.1	7.0
2	3	1	1	4.8	7.0

Variables

a, b	Identifier *variable*
y_{ab}	Observed interactions from **a** to **b**
y_{ba}	Observed interactions from **b** to **a**
$y_{a,1}$	Observed interactions from **a** to **1**
$y_{a,N}$	Observed interactions from **a** to **N**
$y_{\|ab\|}$	Undirected edge between **a** & **b**
S_a, S_b	Individual-level sampling effort
$S_{\|ab\|}$	Dyad-level sampling effort
X_a, X_b	Individual-level trait (*e.g.*, age)
R_a, R_b	Dominance rank
$\Delta R_{\|ab\|}$	Difference in rank between **a** & **b**
$k(t) = y_{\|ab\|}(t) \times y_{\|ac\|}(t)$	