Social network characteristics and their associations with stress in older adults

Closure and balance in a population-based sample

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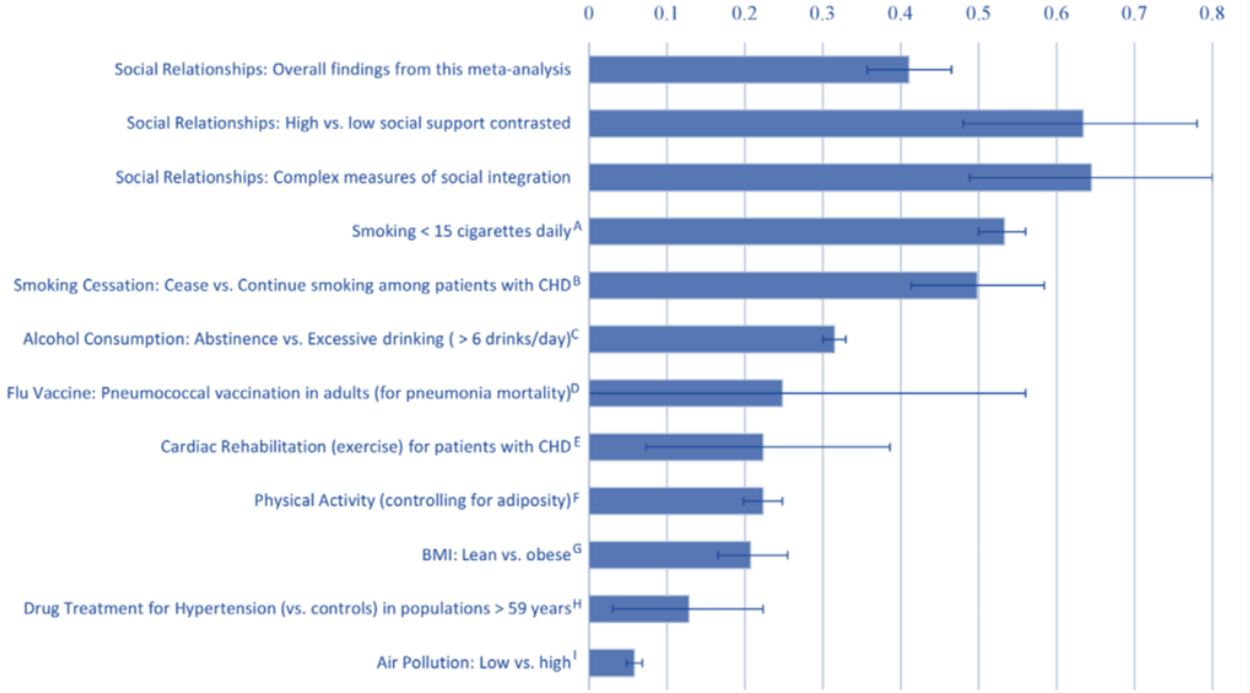
Forthcoming in *Journals of Gerontology: Social Sciences*

HEALTH BENEFITS OF SOCIAL INTEGRATION



Holt-Lunstad, Smith & Layton (2010), PLoS Medicine

Meta-review on social relationships and mortality risk

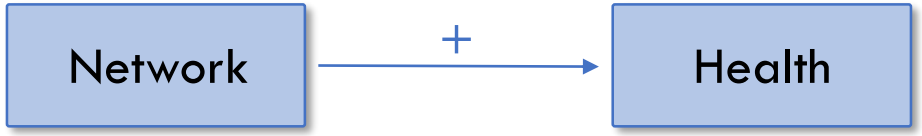
>300,000 individuals followed over 7.5 years

50% greater likelihood of survival for adequate vs. insufficient social relationships

TWO POPULAR EXPLANATIONS

Main Model

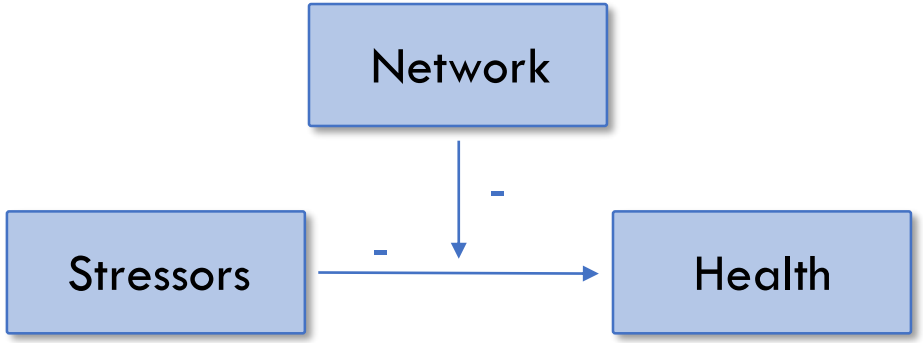
(Berkman et al., 2000, Thoits, 2011)



Direct physiological and biological pathways

Buffer Model

(Berkman et al., 2000, House & Kahn, 1985)

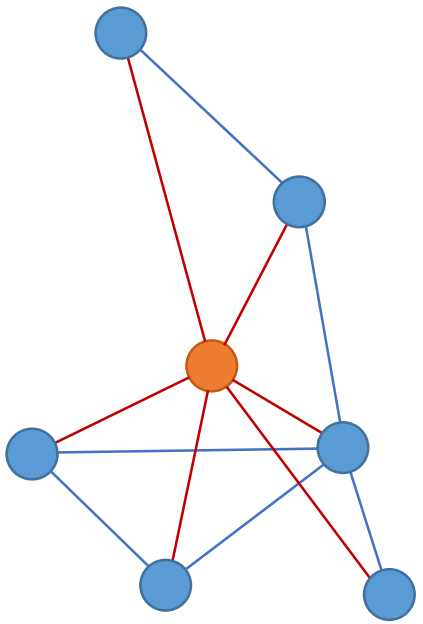


Social support and behavioral mechanisms

THE PROBLEM

Previous research in social gerontology has almost exclusively focused on direct ego-alter ties

Popular explanations include assumptions that may not hold when indirect alter-alter ties are considered



CLOSURE

Support is easily accessible

BALANCE

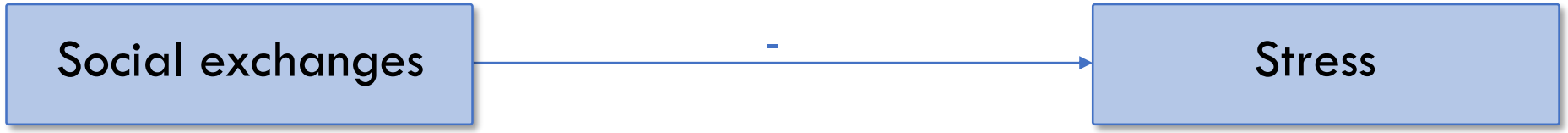
Positive relationships are beneficial

RESEARCH QUESTION

Which kinds of social network structures reduce stress?

Specifically, are closure and balance in triadic relationships associated with perceived stress?

RESILIENCE: COPING WITH STRESS



Effective when they…

Meet demands
Are perceived as helpful
From close (vs. distant) others
From positive (vs. ambivalent) ties

Negative events, chronic strains and traumas

Examples in older age: divorce, retirement, relocation, illness and disability

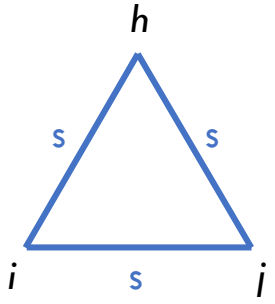
CLOSURE

Social Exchange Theory (Blau, 1964): individuals expect reciprocity in relationships

Dense network structures increase commitment to social exchanges and solidarity

Resource flow further enhanced by indirect reciprocity

HYPOTHESIS 1



The higher the number of closed triads (with three strong ties) in a focal individual's personal network, the lower the level of perceived stress of this individual.

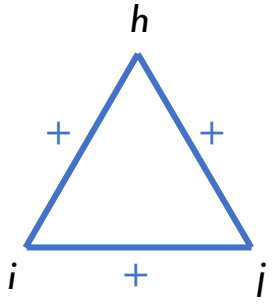
BALANCE

Balance Theory (Heider, 1946): individuals prefer socially balanced states

Product of ties should be positive (3 positive | 1 positive & 2 negative)

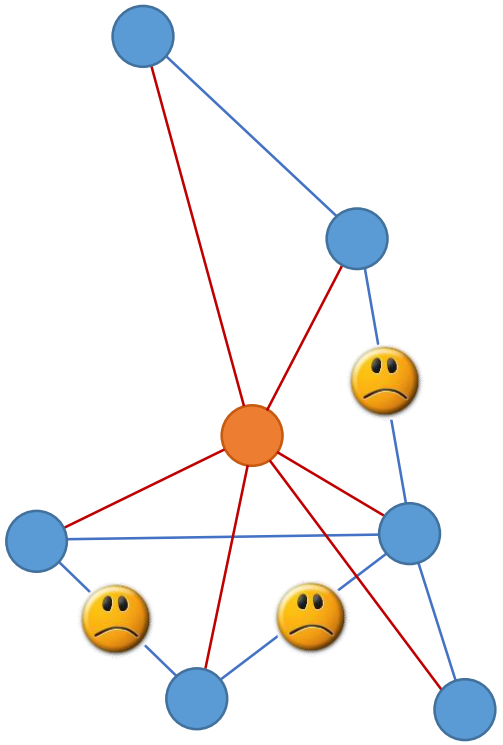
Imbalance causes cognitive dissonance and stressful experiences

HYPOTHESIS 2

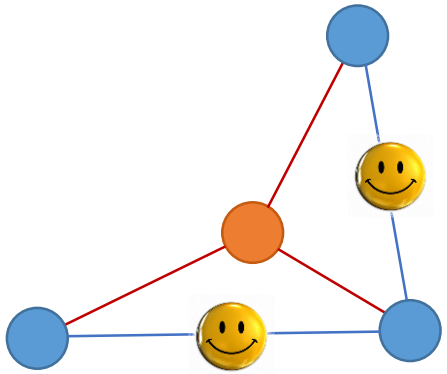


The higher the number of balanced triads (with three positive ties) in a focal individual's personal network, the lower the level of perceived stress of this individual.

HIDDEN POWER OF INDIRECT RELATIONSHIPS



Conflicts in families often involve third parties
(Widmer *et al.* 2018)



Traditional view: Network is functional.
Extended view: False!

Network ist dysfunctional.
False!

CHICAGO HEALTH, AGING, AND SOCIAL RELATIONS STUDY (CHASRS)

Multistage probability sampling design

Born 1935—1952, living in Cook County Illinois

Non-Hispanic White, African American, and non-Black Latino American origin

Paid day-long laboratory protocol at the University of Chicago

Waves	5 (2002—2006)
N individuals	160
N observations	708
M (*SD*) age	57.3 (4.2)
Female	55%

VARIABLES

DEPENDENT

Perceived stress scale
10 items
(Cohen et al., 1983)

INDEPENDENT

closed triads
balanced triads

Using name generator: frequency and valence of ego-alter ties and alter-alter ties

CONFOUNDING

Gender
Ethnicity
Education
Marital status
Household income
Loneliness (UCLA-R)
Network size (# alters)

MEASURING ALTER-ALTER TIES

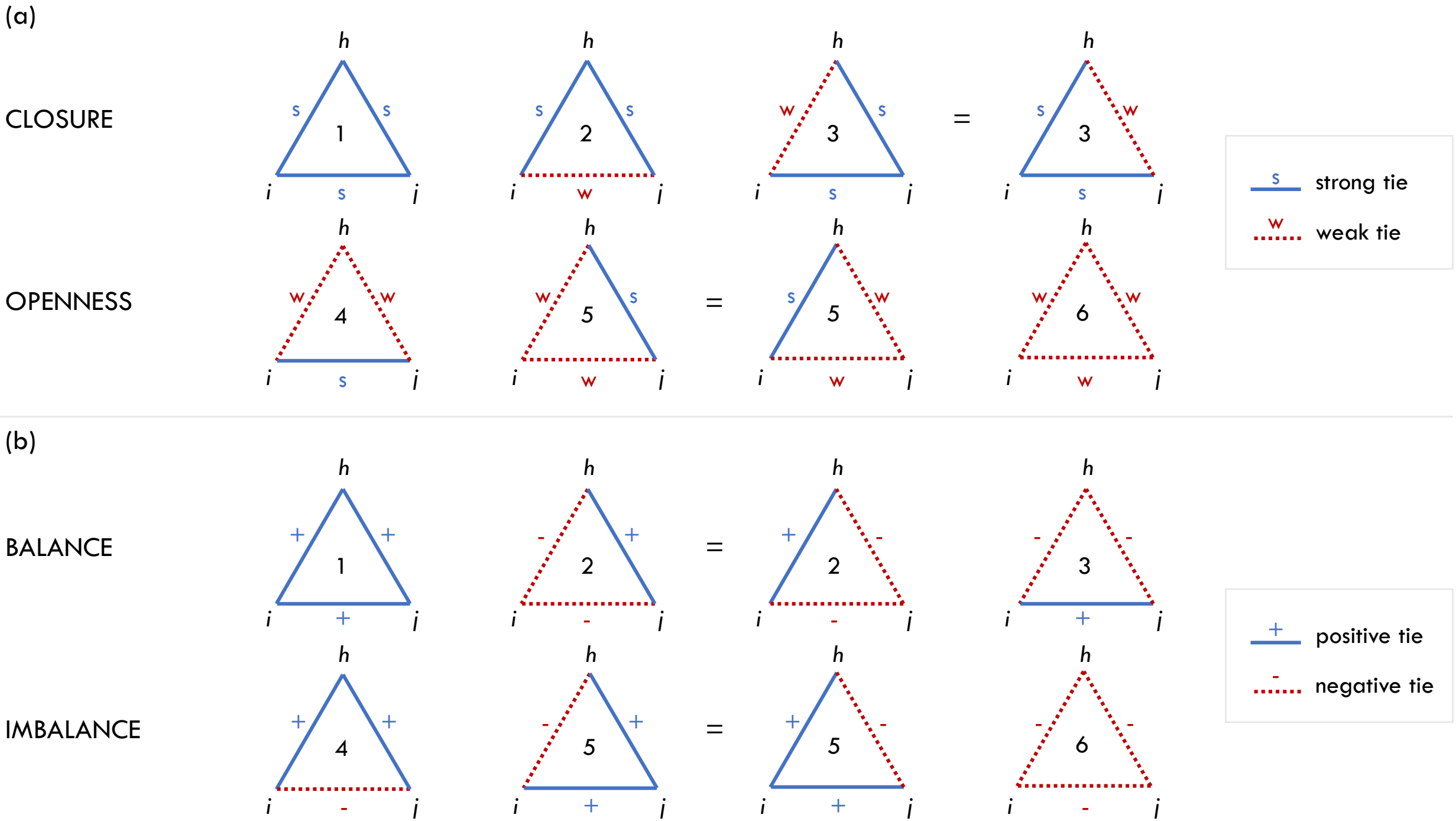
Frequency of Contact

1 Every day
2 Several times a week
3 Once a week
4 Once every two weeks
5 Once a month
6 A couple of times a year
7 Once a year
8 Less than once a year
9 Have never spoken

Valence

-3 Dislike each other
-2
-1
0 Neither like or dislike
1
2
3 Like each other

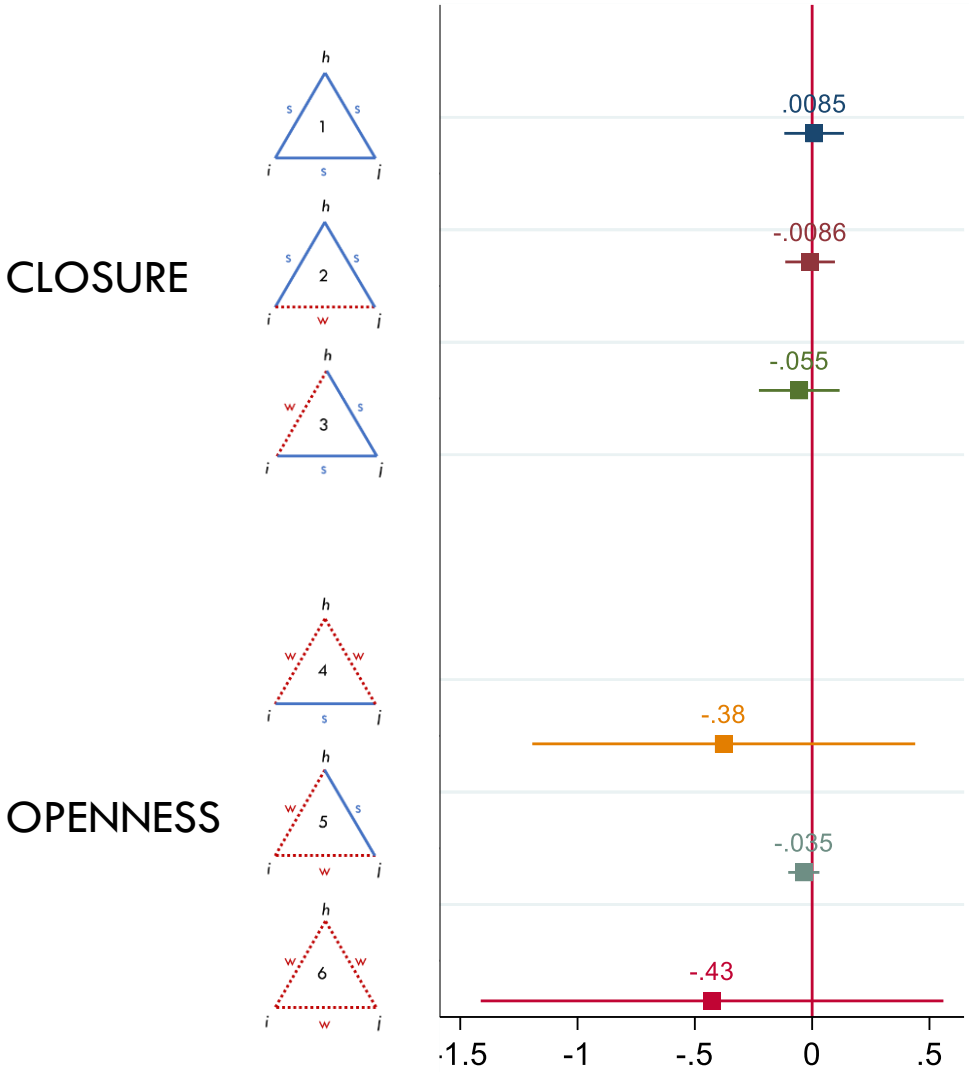
Ego 1	Alter 1		Alter 2		Alter 3		Alter 4		Alter 5	
	frequency	quality	frequency	quality	frequency	quality	frequency	quality	frequency	quality
Alter 1										
Alter 2										
Alter 3										
Alter 4										
Alter 5										

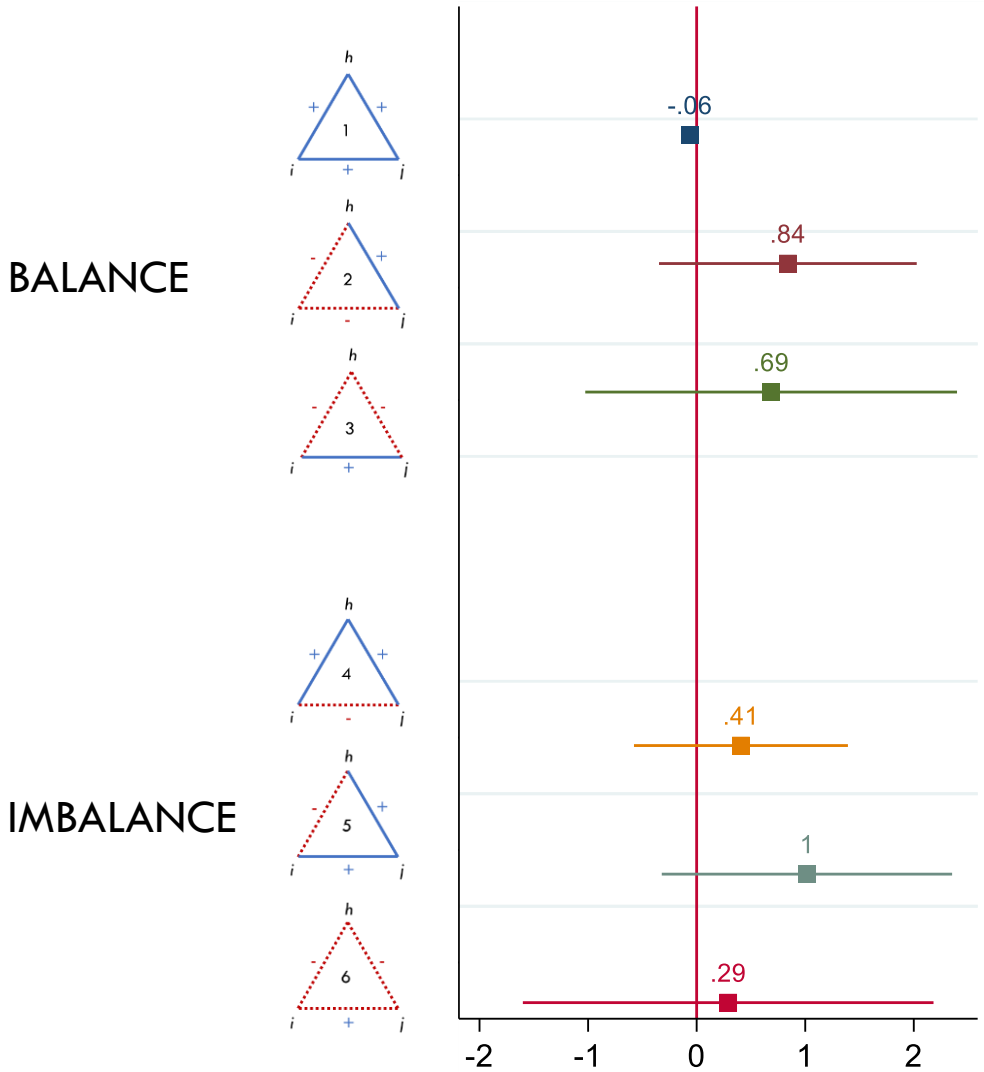

(a)
CLOSURE
OPENNESS
h
i
j
s
w
1
2
3
4
5
6
=
strong tie
weak tie
(b)
BALANCE
IMBALANCE
+
-
positive tie
negative tie

ANALYTICAL STRATEGY

1. Unadjusted fixed-effects for all triad types
2. Adjusted fixed effects with time-varying confounders
3. Adjusted random-effects models with time-constant confounders
4. Robustness tests

UNADJUSTED FIXED EFFECTS



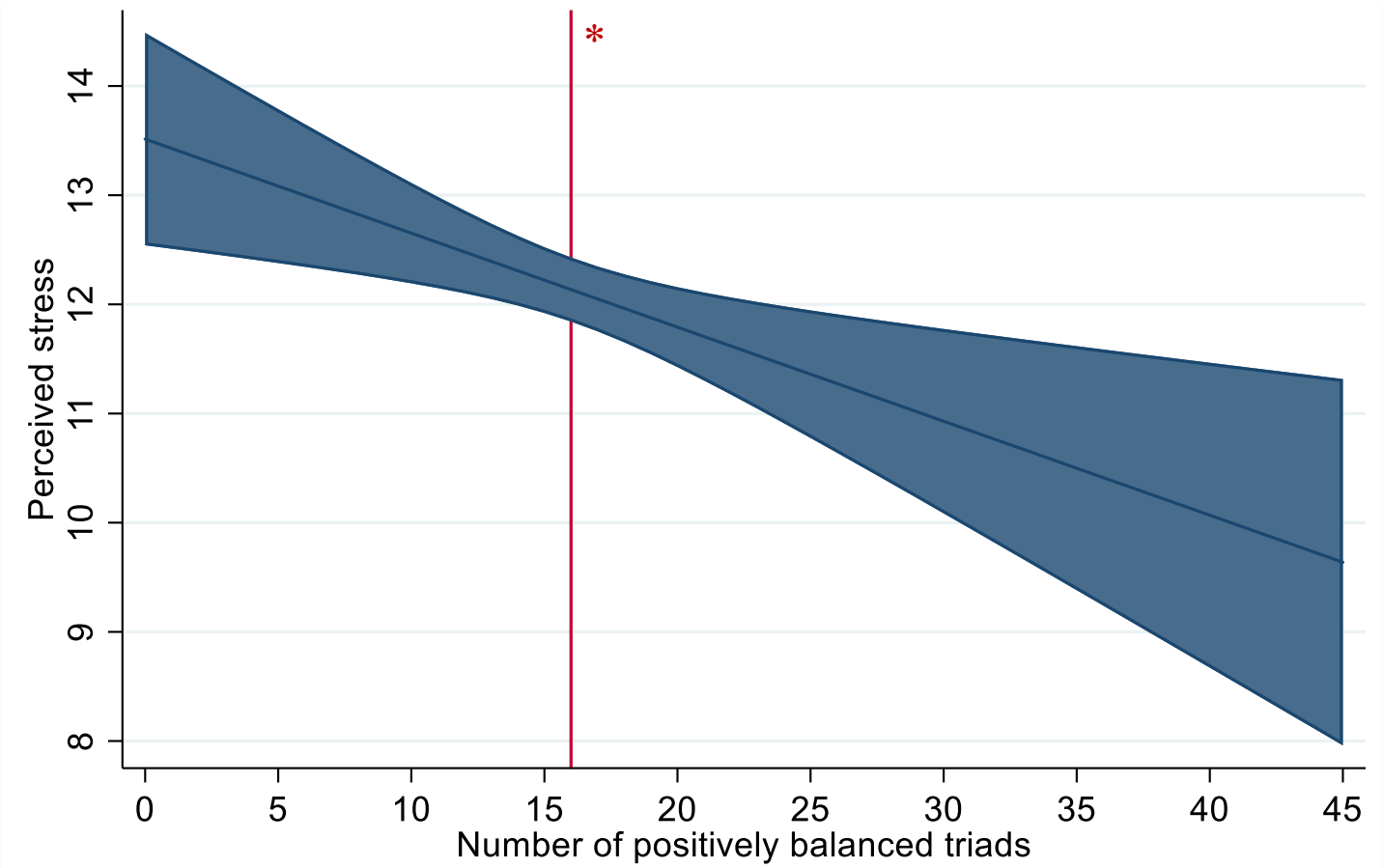


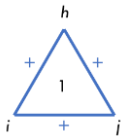
Variables	MODEL 1 fixed B	(SE)	MODEL 2 fixed B	(SE)	MODEL 3 fixed B	(SE)	MODEL 4 fixed B	(SE)	MODEL 5 random B	(SE)
Confounders										
Age									-0.167*	(0.081)
Female									1.715*	(0.694)
Ethnicity (ref.=White)										
Black									0.802	(0.779)
Hispanic									0.153	(0.906)
Education (ref.< high school)										
High school/GED									0.242	(1.233)
Some college									-0.837	(1.273)
BA/BS									-1.301	(1.428)
Graduate school									-1.788	(1.421)
Marital status (ref.=married)										
Living with partner	-2.082	(1.535)	-2.093	(1.539)	-1.865	(1.530)	-1.836	(1.532)	-0.895	(1.002)
Separated	1.608	(1.883)	1.506	(1.895)	1.605	(1.872)	1.416	(1.882)	2.163	(1.316)
Divorced	-1.955	(1.564)	-2.028	(1.572)	-1.747	(1.558)	-1.880	(1.562)	-0.637	(0.804)
Widowed									-0.633	(1.231)
Never married	-2.413	(2.522)	-2.440	(2.530)	-2.229	(2.508)	-2.218	(2.513)	-2.164	(1.280)
Household income	0.219	(0.214)	0.210	(0.215)	0.199	(0.213)	0.173	(0.214)	-0.100	(0.150)
Loneliness	0.199***	(0.038)	0.201***	(0.039)	0.201***	(0.038)	0.206***	(0.038)	0.273***	(0.028)
Network size	-0.017	(0.089)	-0.029	(0.095)	0.138	(0.106)	0.120	(0.108)	0.121	(0.096)
Network embeddedness										
Closure Type 1 (sss)			0.043	(0.074)			0.092	(0.075)	0.121	(0.066)
Closure Type 2 (ssw)			-0.015	(0.060)			-0.011	(0.060)	-0.037	(0.054)
Balance Type 1 (ppp)					-0.077**	(0.028)	-0.086**	(0.029)	-0.080**	(0.027)
Imbalance Type 4 (ppn)					0.439	(0.488)	0.427	(0.489)	0.313	(0.456)
Intercept	4.581*	(1.987)	4.578*	(1.991)	4.393*	(1.978)	4.364*	(1.979)	12.175*	(5.350)
N(individuals)	160		160		160		160		160	
N(observations)	708		708		708		708		708	

Hypothesis 1 rejected

Hypothesis 2 supported

MORE BALANCE RELATES TO LESS STRESS





*Threshold based on $n(n-1)/2$ translates to:

High stress: n <= 6 alters
Low stress: n >= 7 alters

Mean = 16, SD = 11

RESULTS APPEAR TO BE ROBUST

Hausman test

Additional confounders:

- All triad types
- Number of negative ties
- Number of positive ties
- Number of neutral ties

Mediation and moderation

Alternative cut-offs for tie strength and valence

Reverse causation using LGM and SEM

LESSONS LEARNED

✓ FOUND

Balance in personal networks reduces stress

Net of socio-demographic and social confounders, relationship strength

✗ NOT FOUND

No effect of imbalance – possibly due to low statistical power

No effect of closure – weak ties may also offer health benefits (Granovetter, 1973)

! CONCLUSION

Ignoring interconnections between older adults' contacts generates incomplete picture

Consider "social network gerontology"

RELATED PUBLICATIONS

Ellwardt, L., Aartsen, M., Van Tilburg, T. (2016): Types of Non-kin Networks and Their Association with Survival in Late Adulthood: A Latent-class Approach. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 72(4): 694-705.

Ellwardt, L., Van Tilburg, T., Aartsen, M. (2015): The Mix Matters: Complex Personal Networks Relate to Higher Cognitive Functioning in Old Age. *Social Science & Medicine*, 125, 107-115.

Ellwardt, L., Van Tilburg, T., Aartsen, M., Wittek, R., Steverink, N. (2015): Personal Networks and Mortality Risk in Older Adults: A Twenty-year Longitudinal Study. *PLoS ONE* 10(3): e0116731.

Ellwardt, L., Peter, S., Prägg, P., Steverink, N. (2014): Social Contacts of Older People in 27 European Countries: The Role of Welfare Spending and Economic Inequality. *European Sociological Review* 30(4), 413-430.

Ellwardt, L., Aartsen, M., Deeg, D., Steverink, N. (2013): Does Loneliness Mediate the Relation between Social Support and Cognitive Functioning in Later Life? *Social Science & Medicine*, 98, 116-124.

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