

Supplementary material

Symptom-specific effects of psychotherapy versus combined therapy in the treatment of mild to moderate depression: a network approach

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Sample characteristics

A total of 186 patients were included in this study, of whom 103 received psychotherapy and 83 received combined therapy. Mean age of the sample was 35.4 (SD=10.8) years and 67.7% were female. No differences in sociodemographic or depression characteristics were found between the treatment groups (see **Table S1**).

Network estimation method

An L1-regularized weighted network of the type of treatment (psychotherapy versus combined therapy) and change scores of all depressive symptoms was estimated and visualized with R-package qgraph [1]. As input for the network estimation procedure, a correlation matrix consisting of polyserial correlations (between the type of treatment and change scores of symptoms) and Pearson correlations (between change scores of symptoms) was used (see **Table S2** for this input matrix). The network estimation technique calculated partial correlations for all pairs of variables, which indicate associations among symptoms while controlling for all other variables in the network. To prevent overfitting, an l_1 -penalty [2] was used to estimate possible networks with different levels of sparsity. The model with the best fit to the data was selected using the extended Bayesian information criterion (EBIC) [3] with hyperparameter $\gamma=0.5$ [4]. This technique has been shown to yield adequate network structures [4-6].

Accuracy of the estimates in the network

To investigate the accuracy of estimated connections in the network, R-package bootnet [7] was used to calculate 95% confidence intervals around connection weights. Bootstrapped confidence intervals were calculated by drawing 10,000 bootstrap samples of the data and recalculating connection weights for each sample. Although these confidence intervals can inform on the precision of parameter estimates, it is important to stress that they should not be interpreted as a test for significance of a connection being different from zero as the l_1 -penalty already ensured that connections included in the network model were of sufficient strength [7]. **Table S3** shows that the confidence intervals of associations in the network were rather wide and showed overlap, implying that connection weights should be interpreted with caution. Still, several connections were significantly stronger than others. The association between thoughts of suicide [sui] and thoughts of death [dea] (partial correlation coefficient=0.49, 95%CI=0.37-0.62), for example, was significantly stronger than all other associations in the network, except for the association between depressed mood [moo] and worry [wor] (partial

correlation coefficient=0.33, 95%CI=0.23-0.44). This indicates that the association between thoughts of suicide [sui] and thoughts of death [dea] is reliably one of the strongest in the network.

Table S1. Sample characteristics at baseline

	Psychotherapy N=103	Combined therapy N=83	p
	N (%) / mean (SD)	N (%) / mean (SD)	
<u>Sociodemographics</u>			
Age	35.5 (11.0)	35.3 (10.6)	.94
Female	70 (68.0%)	56 (67.5%)	1.00
Education			.54
Low	13 (12.6%)	11 (13.3%)	
Middle	36 (35.0%)	35 (42.2%)	
High	54 (52.4%)	37 (44.6%)	
<u>Depression characteristics</u>			
Sum score of all symptoms	49.9 (8.9)	49.0 (9.5)	.49
Individual depressive symptoms			
Obsessive thoughts [obs]	3.6 (0.9)	3.5 (1.0)	.25
Loss of sexual interest/pleasure [sex]	2.6 (1.4)	2.7 (1.4)	.83
Low in energy [ene]	3.8 (1.1)	3.9 (1.0)	.44
Thoughts of suicide [sui]	1.7 (0.9)	1.6 (0.9)	.44
Poor appetite [app]	1.9 (1.2)	2.0 (1.2)	.68
Emotional lability [emo]	3.0 (1.3)	3.2 (1.4)	.47
Feeling entrapped [ent]	3.2 (1.2)	3.3 (1.2)	.49
Self-blame [bla]	3.2 (1.2)	2.9 (1.3)	.08
Loneliness [lon]	3.3 (1.2)	3.1 (1.2)	.20
Blue mood [moo]	3.8 (0.9)	3.8 (1.0)	.96
Worry [wor]	4.1 (0.8)	4.1 (0.9)	.58
Loss of interest [int]	3.3 (1.1)	3.1 (1.2)	.30
Concentration problems [con]	3.4 (1.1)	3.3 (1.1)	.44
Hopelessness [hop]	3.6 (1.1)	3.5 (1.1)	.62
Thoughts of death [dea]	2.1 (1.2)	2.1 (1.2)	.63
Worthlessness [wot]	3.3 (1.2)	3.2 (1.2)	.64

P-values are based on chi square analyses for categorical variables and independent t-tests for continuous variables.

Table S2. Correlations between the type of treatment and change scores of depressive symptoms

	Treatment type [tr]	Obsessive thoughts [obs]	Loss of sexual interest/pleasure [sex]	Low in energy [ene]	Thoughts of suicide [sui]	Poor appetite [app]	Emotional lability [emo]	Feeling entrapped [ent]	Self-blame [bla]	Loneliness [lon]	Blue mood [moo]	Worry [wor]	Loss of interest [int]	Concentration problems [con]	Hopelessness [hop]	Thoughts of death [dea]	Worthlessness [wot]
Treatment type [tr]	1.00	0.21	0.12	0.19	0.02	0.06	0.28	0.33	0.07	0.13	0.20	0.27	0.11	0.14	0.25	0.13	0.11
Obsessive thoughts [obs]	0.21	1.00	0.32	0.32	0.26	0.24	0.46	0.42	0.40	0.43	0.59	0.60	0.34	0.44	0.50	0.38	0.36
Loss of sexual interest/pleasure [sex]	0.12	0.32	1.00	0.35	0.09	0.10	0.25	0.28	0.20	0.16	0.29	0.28	0.32	0.30	0.30	0.10	0.21
Low in energy [ene]	0.19	0.32	0.35	1.00	0.13	0.28	0.35	0.39	0.21	0.28	0.37	0.39	0.52	0.42	0.37	0.19	0.34
Thoughts of suicide [sui]	0.02	0.26	0.09	0.13	1.00	0.09	0.24	0.22	0.20	0.21	0.29	0.15	0.33	0.19	0.33	0.62	0.24
Poor appetite [app]	0.06	0.24	0.10	0.28	0.09	1.00	0.20	0.33	0.18	0.26	0.29	0.20	0.25	0.37	0.34	0.27	0.14
Emotional lability [emo]	0.28	0.46	0.25	0.35	0.24	0.20	1.00	0.38	0.34	0.34	0.46	0.53	0.44	0.35	0.45	0.25	0.36
Feeling entrapped [ent]	0.33	0.42	0.28	0.39	0.22	0.33	0.38	1.00	0.40	0.39	0.58	0.50	0.46	0.46	0.57	0.22	0.39
Self-blame [bla]	0.07	0.40	0.20	0.21	0.20	0.18	0.34	0.40	1.00	0.40	0.43	0.44	0.32	0.34	0.43	0.20	0.43
Loneliness [lon]	0.13	0.43	0.16	0.28	0.21	0.26	0.34	0.39	0.40	1.00	0.57	0.44	0.45	0.53	0.50	0.25	0.42
Blue mood [moo]	0.20	0.59	0.29	0.37	0.29	0.29	0.46	0.58	0.43	0.57	1.00	0.72	0.56	0.63	0.64	0.37	0.52
Worry [wor]	0.27	0.60	0.28	0.39	0.15	0.20	0.53	0.50	0.44	0.44	0.72	1.00	0.48	0.53	0.55	0.24	0.43
Loss of interest [int]	0.11	0.34	0.32	0.52	0.33	0.25	0.44	0.46	0.32	0.45	0.56	0.48	1.00	0.59	0.48	0.35	0.43
Concentration problems [con]	0.14	0.44	0.30	0.42	0.19	0.37	0.35	0.46	0.34	0.53	0.63	0.53	0.59	1.00	0.50	0.30	0.42
Hopelessness [hop]	0.25	0.50	0.30	0.37	0.33	0.34	0.45	0.57	0.43	0.50	0.64	0.55	0.48	0.50	1.00	0.50	0.52
Thoughts of death [dea]	0.13	0.38	0.10	0.19	0.62	0.27	0.25	0.22	0.20	0.25	0.37	0.24	0.35	0.30	0.50	1.00	0.32
Worthlessness [wot]	0.11	0.36	0.21	0.34	0.24	0.14	0.36	0.39	0.43	0.42	0.52	0.43	0.43	0.42	0.52	0.32	1.00

The correlation matrix consists of polyserial correlations between Treatment [tr] and change scores of depressive symptoms and Pearson correlations between change scores of depressive symptoms.

Table S3. Partial correlations and their 95% confidence intervals between the type of treatment and change scores of depressive symptoms

	Treatment type [tr]	Obsessive thoughts [obs]	Loss of sexual interest/pleasure [sex]	Low in energy [ene]	Thoughts of suicide [sui]	Poor appetite [app]	Emotional lability [emo]	Feeling entrapped [ent]	Self-blame [bla]	Loneliness [lon]	Blue mood [moo]	Worry [wor]	Loss of interest [int]	Concentration problems [con]	Hopelessness [hop]	Thoughts of death [dea]	Worthlessness [wot]
Treatment type [tr]	-	0.00 (-0.08-0.08)	0.00 (-0.08-0.08)	0.00 (-0.09-0.10)	0.00 (0.08-0.08)	0.00 (0.07-0.07)	0.11 (-0.03-0.25)	0.16 (0.01-0.31)	0.00 (-0.08-0.08)	0.00 (-0.05-0.05)	0.00 (-0.03-0.03)	0.04 (-0.06-0.14)	0.00 (-0.06-0.06)	0.00 (-0.04-0.04)	0.01 (-0.08-0.09)	0.00 (-0.06-0.06)	0.00 (-0.05-0.05)
Obsessive thoughts [obs]	0.00 (-0.08-0.08)	-	0.10 (0.00-0.21)	0.00 (-0.07-0.07)	0.00 (-0.04-0.04)	0.00 (-0.07-0.07)	0.12 (-0.01-0.25)	0.01 (-0.07-0.10)	0.08 (-0.03-0.18)	0.06 (-0.04-0.16)	0.14 (0.03-0.25)	0.21 (0.08-0.35)	0.00 (-0.02-0.02)	0.01 (-0.07-0.08)	0.04 (-0.04-0.13)	0.09 (0.00-0.18)	0.00 (-0.06-0.06)
Loss of sexual interest/pleasure [sex]	0.00 (-0.08-0.08)	0.10 (0.00-0.21)	-	0.16 (0.04-0.29)	0.00 (-0.02-0.02)	0.00 (-0.04-0.04)	0.01 (-0.07-0.09)	0.02 (-0.06-0.11)	0.00 (-0.07-0.07)	0.00 (-0.03-0.03)	0.00 (-0.04-0.04)	0.00 (-0.06-0.06)	0.05 (-0.05-0.15)	0.04 (-0.05-0.13)	0.05 (-0.03-0.12)	0.00 (-0.03-0.03)	0.00 (-0.04-0.04)
Low in energy [ene]	0.01 (-0.09-0.10)	0.00 (-0.07-0.07)	0.16 (0.04-0.29)	-	0.00 (-0.02-0.02)	0.07 (-0.06-0.20)	0.05 (-0.05-0.15)	0.07 (-0.02-0.17)	0.00 (-0.03-0.03)	0.00 (-0.03-0.03)	0.00 (-0.02-0.02)	0.05 (-0.02-0.12)	0.25 (0.14-0.37)	0.05 (-0.06-0.17)	0.00 (-0.07-0.07)	0.00 (-0.02-0.02)	0.05 (-0.04-0.14)
Thoughts of suicide [sui]	0.00 (-0.08-0.08)	0.00 (-0.04-0.04)	0.00 (-0.02-0.02)	0.00 (-0.02-0.02)	-	0.00 (-0.04-0.04)	0.02 (-0.05-0.08)	0.00 (-0.03-0.03)	0.00 (-0.06-0.06)	0.00 (-0.04-0.04)	0.00 (-0.04-0.04)	0.00 (-0.04-0.04)	0.10 (0.01-0.19)	0.00 (-0.01-0.01)	0.00 (-0.04-0.04)	0.49 (0.37-0.62)	0.00 (-0.05-0.05)
Poor appetite [app]	0.00 (0.07-0.07)	0.00 (-0.07-0.07)	0.00 (-0.04-0.04)	0.07 (-0.06-0.20)	0.00 (-0.04-0.04)	-	0.00 (-0.05-0.05)	0.09 (-0.01-0.19)	0.00 (-0.05-0.05)	0.00 (-0.08-0.08)	0.00 (-0.04-0.04)	0.00 (-0.02-0.02)	0.00 (-0.04-0.04)	0.15 (0.03-0.27)	0.06 (-0.03-0.16)	0.06 (-0.03-0.16)	0.00 (-0.06-0.06)
Emotional lability [emo]	0.11 (-0.03-0.25)	0.12 (-0.01-0.25)	0.01 (-0.07-0.09)	0.05 (-0.05-0.15)	0.02 (-0.05-0.08)	0.00 (-0.05-0.05)	-	0.00 (-0.07-0.08)	0.04 (-0.05-0.13)	0.00 (-0.06-0.06)	0.00 (-0.05-0.05)	0.19 (0.07-0.31)	0.12 (-0.01-0.24)	0.00 (-0.03-0.03)	0.07 (-0.03-0.17)	0.00 (-0.03-0.03)	0.04 (-0.06-0.15)
Feeling entrapped [ent]	0.16 (0.01-0.31)	0.01 (-0.07-0.10)	0.02 (-0.06-0.11)	0.07 (-0.02-0.17)	0.00 (-0.03-0.03)	0.09 (-0.01-0.19)	0.00 (-0.07-0.08)	-	0.09 (-0.02-0.21)	0.00 (-0.06-0.06)	0.14 (0.03-0.26)	0.05 (-0.04-0.13)	0.07 (-0.05-0.19)	0.03 (-0.06-0.13)	0.20 (0.10-0.30)	0.00 (-0.03-0.03)	0.00 (-0.06-0.06)
Self-blame [bla]	0.00 (-0.08-0.08)	0.08 (-0.03-0.18)	0.00 (-0.07-0.07)	0.00 (-0.03-0.03)	0.00 (-0.06-0.06)	0.00 (-0.05-0.05)	0.04 (-0.05-0.13)	0.09 (-0.02-0.21)	-	0.10 (-0.01-0.21)	0.00 (-0.05-0.05)	0.10 (-0.01-0.21)	0.00 (-0.05-0.05)	0.00 (-0.05-0.05)	0.07 (-0.04-0.18)	0.00 (-0.03-0.03)	0.17 (0.05-0.28)
Loneliness [lon]	0.00 (-0.05-0.05)	0.06 (-0.04-0.16)	0.00 (-0.03-0.03)	0.00 (-0.03-0.03)	0.00 (-0.04-0.04)	0.00 (-0.08-0.08)	0.00 (-0.06-0.06)	0.00 (-0.06-0.06)	0.10 (-0.01-0.21)	-	0.15 (0.03-0.26)	0.00 (-0.04-0.04)	0.06 (-0.05-0.18)	0.18 (0.04-0.32)	0.10 (-0.02-0.23)	0.00 (-0.02-0.02)	0.07 (-0.05-0.19)
Blue mood [moo]	0.00 (-0.03-0.03)	0.14 (0.03-0.25)	0.00 (-0.04-0.04)	0.00 (-0.02-0.02)	0.00 (-0.04-0.04)	0.00 (-0.04-0.04)	0.00 (-0.05-0.05)	0.14 (0.03-0.26)	0.00 (-0.05-0.05)	0.15 (0.03-0.26)	-	0.33 (0.22-0.44)	0.09 (-0.01-0.20)	0.19 (0.06-0.32)	0.17 (0.06-0.27)	0.00 (-0.04-0.04)	0.10 (-0.01-0.22)
Worry [wor]	0.04 (-0.06-0.14)	0.21 (0.08-0.35)	0.00 (-0.06-0.06)	0.05 (-0.02-0.12)	0.00 (-0.04-0.04)	0.00 (-0.02-0.02)	0.19 (0.07-0.31)	0.05 (-0.04-0.13)	0.10 (-0.01-0.21)	0.00 (-0.04-0.04)	0.33 (0.22-0.44)	-	0.00 (-0.07-0.07)	0.06 (-0.03-0.15)	0.04 (-0.05-0.12)	0.00 (-0.02-0.02)	0.00 (-0.06-0.06)
Loss of interest [int]	0.00 (-0.06-0.06)	0.00 (-0.02-0.02)	0.05 (-0.05-0.15)	0.25 (0.14-0.37)	0.10 (0.01-0.19)	0.00 (-0.04-0.04)	0.12 (-0.01-0.24)	0.07 (-0.05-0.19)	0.00 (-0.05-0.05)	0.06 (-0.05-0.18)	0.09 (-0.01-0.20)	0.00 (-0.07-0.07)	-	0.23 (0.10-0.36)	0.00 (-0.05-0.06)	0.02 (-0.05-0.08)	0.08 (-0.03-0.19)
Concentration problems [con]	0.00 (-0.04-0.04)	0.01 (-0.07-0.08)	0.04 (-0.05-0.13)	0.05 (-0.06-0.17)	0.00 (-0.01-0.01)	0.15 (0.03-0.27)	0.00 (-0.03-0.03)	0.03 (-0.06-0.13)	0.00 (-0.05-0.05)	0.18 (0.04-0.32)	0.19 (0.06-0.32)	0.06 (-0.03-0.15)	0.23 (0.10-0.36)	-	0.02 (-0.06-0.09)	0.00 (-0.04-0.04)	0.03 (-0.06-0.12)
Hopelessness [hop]	0.01 (-0.08-0.09)	0.04 (-0.04-0.13)	0.05 (-0.03-0.12)	0.00 (-0.07-0.07)	0.00 (-0.04-0.04)	0.06 (-0.03-0.16)	0.07 (-0.03-0.17)	0.20 (0.10-0.30)	0.07 (-0.04-0.18)	0.10 (-0.02-0.23)	0.17 (0.06-0.27)	0.04 (-0.05-0.12)	0.00 (-0.05-0.06)	0.02 (-0.06-0.09)	-	0.22 (0.12-0.31)	0.16 (0.05-0.27)
Thoughts of death [dea]	0.00 (-0.06-0.06)	0.09 (0.00-0.18)	0.00 (-0.03-0.03)	0.00 (-0.02-0.02)	0.49 (0.37-0.62)	0.06 (-0.03-0.16)	0.00 (-0.03-0.03)	0.00 (-0.03-0.03)	0.00 (-0.03-0.03)	0.00 (-0.02-0.02)	0.00 (-0.04-0.04)	0.00 (-0.02-0.02)	0.02 (-0.05-0.08)	0.00 (-0.04-0.04)	0.22 (0.12-0.31)	-	0.03 (-0.04-0.10)
Worthlessness [wot]	0.00 (-0.05-0.05)	0.00 (-0.06-0.06)	0.00 (-0.04-0.04)	0.05 (-0.04-0.14)	0.00 (-0.05-0.05)	0.00 (-0.06-0.06)	0.04 (-0.06-0.15)	0.00 (-0.06-0.06)	0.17 (0.05-0.28)	0.07 (-0.05-0.19)	0.10 (-0.01-0.22)	0.00 (-0.06-0.06)	0.08 (-0.03-0.19)	0.03 (-0.06-0.12)	0.16 (0.05-0.27)	0.03 (-0.04-0.10)	-

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