

Supplementary Material

for

**Emotion Regulation as a Mechanism of Mindfulness in Individual Cognitive-Behavioral
Therapy for Depression and Anxiety Disorders**

Luise Pruessner¹, Christina Timm¹, Julia Kalmar², Hinrich Bents², Sven Barnow¹, Johannes Mander²

¹ Department of Psychology, Heidelberg University (Germany)


² Center for Psychological Psychotherapy, Heidelberg University (Germany)

Author Note

Luise Pruessner  <https://orcid.org/0000-0002-4796-9682>

Christina Timm  <https://orcid.org/0000-0002-3675-6163>

Julia Kalmar  <https://orcid.org/0000-0002-3952-9070>

Sven Barnow  <https://orcid.org/0009-0004-5359-9384>

Johannes Mander  <https://orcid.org/0000-0003-0358-1106>

The authors declare that they have no conflict of interest regarding the publication of this article. Data to replicate the results reported in this paper are available on request through the *Open Science Framework* (<https://osf.io/syk25/>). Correspondence should be addressed to Luise Pruessner, Department of Psychology, Heidelberg University, Hauptstr. 47-51, 69117 Heidelberg, Germany. Email: luise.pruessner@psychologie.uni-heidelberg.de.

Table S1

Multilevel Structural Equation Modeling with Coefficients for Total, Direct, and Indirect Effects of Rumination, Avoidance, and Suppression on Depressive Symptoms

	Level 1 (<i>within</i>)					Level 2 (<i>between</i>)				
	<i>Estimate</i>	95% CI	<i>SE</i>	<i>z</i>	<i>p</i>	<i>Estimate</i>	95% CI	<i>SE</i>	<i>z</i>	<i>p</i>
<i>Total effect (c)</i>										
Mindfulness → Depression	-11.52	-13.75 -9.30	1.14	-10.14	< .001	-15.46	-19.31 -11.61	1.96	-7.87	< .001
<i>Indirect effects (ab)</i>										
Mindfulness → Rumination → Depression	-1.09	-1.80 -0.39	0.36	-3.03	.002	-2.81	-4.85 -0.78	1.04	-2.71	.007
Mindfulness → Avoidance → Depression	-0.06	-0.55 0.43	0.25	-0.25	.803	0.28	-1.29 1.85	0.80	0.35	.725
Mindfulness → Suppression → Depression	-0.27	-0.63 0.09	0.18	-1.47	.142	-2.48	-4.40 -0.57	0.98	-2.55	.011
<i>Direct effects (c', a, b)</i>										
Mindfulness → Depression	-10.10	-12.43 -7.77	1.19	-8.50	< .001	-10.44	-14.58 -6.30	2.11	-4.94	< .001
Rumination → Depression	1.26	0.53 2.00	0.37	3.39	< .001	4.83	2.76 6.91	1.06	4.57	< .001
Avoidance → Depression	0.10	-0.65 0.84	0.38	0.25	.803	-0.49	-3.21 2.23	1.39	-0.35	.723
Suppression → Depression	0.76	-0.17 1.68	0.47	1.61	.108	4.39	1.78 7.00	1.33	3.30	< .001
Mindfulness → Rumination	-0.86	-1.12 -0.61	0.13	-6.65	< .001	-0.58	-0.93 -0.24	0.18	-3.29	< .001
Mindfulness → Avoidance	-0.65	-0.93 -0.38	0.14	-4.72	< .001	-0.57	-0.85 -0.28	0.15	-3.88	< .001
Mindfulness → Suppression	-0.36	-0.55 -0.16	0.10	-3.57	< .001	-0.57	-0.88 -0.27	0.16	-3.66	< .001
Model fit	AIC	BIC	CFI	RMSEA	TLI	SRMR				
	7429.333	7577.675	0.999	0.031	0.967	0.000	0.014			

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion; RMSEA = Root-mean-square error of approximation; CFI = Comparative fit index; TLI = Tucker-Lewis-Index; SRMR = Standardized root-mean-square residual.

Table S2

Multilevel Structural Equation Modeling with Coefficients for Total, Direct and Indirect Effects of Reappraisal, Acceptance, and Problem-Solving on Depressive Symptoms

	Level 1 (<i>within</i>)					Level 2 (<i>between</i>)						
	<i>Estimate</i>	95% CI		<i>SE</i>	<i>z</i>	<i>p</i>	<i>Estimate</i>	95% CI		<i>SE</i>	<i>z</i>	<i>p</i>
Total effect (c)												
Mindfulness → Depression	-11.53	-13.76	-9.30	1.14	-10.14	< .001	-15.37	-19.22	-11.52	1.96	-7.83	< .001
Indirect effects (ab)												
Mindfulness → Reappraisal → Depression	-0.73	-1.38	-0.08	0.33	-2.20	.028	-0.84	-1.62	-0.06	0.40	-2.10	.036
Mindfulness → Acceptance → Depression	-0.70	-1.34	-0.05	0.33	-2.11	.035	-0.59	-1.33	0.15	0.38	-1.55	.120
Mindfulness → Problem-Solving → Depression	0.21	-0.19	0.61	0.21	1.02	.310	0.19	-0.31	0.70	0.26	0.75	.452
Direct effects (c', a, b)												
Mindfulness → Depression	-10.31	-12.64	-7.98	1.19	-8.67	< .001	-10.45	-12.84	-8.06	1.22	-8.57	< .001
Reappraisal → Depression	-1.00	-1.84	-0.17	0.42	-2.36	.018	-1.13	-2.11	-0.15	0.50	-2.26	.024
Acceptance → Depression	-0.90	-1.69	-0.12	0.40	-2.25	.024	-0.75	-1.66	0.16	0.46	-1.61	.107
Problem-Solving → Depression	0.47	-0.41	1.36	0.45	1.05	.293	0.43	-0.67	1.53	0.56	0.77	.444
Mindfulness → Reappraisal	0.73	0.49	0.97	0.12	5.89	< .001	0.74	0.49	0.99	0.13	5.77	< .001
Mindfulness → Acceptance	0.77	0.51	1.03	0.13	5.75	< .001	0.78	0.52	1.05	0.14	5.76	< .001
Mindfulness → Problem-Solving	0.44	0.23	0.66	0.11	4.06	< .001	0.74	0.49	0.99	0.13	5.77	< .001
Model fit	AIC		BIC		CFI		RMSEA		TLI		SRMR	
	7358.585		7507.063		0.997		0.044		0.939		0.000 0.019	

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion; RMSEA = Root-mean-square error of approximation; CFI = Comparative fit index; TLI = Tucker-Lewis-Index; SRMR = Standardized root-mean-square residual.

Table S3

Multilevel Structural Equation Modeling with Coefficients for Total, Direct, and Indirect Effects of Rumination, Avoidance, and Suppression on Anxiety Symptoms

	Level 1 (<i>within</i>)						Level 2 (<i>between</i>)					
	<i>Estimate</i>	95% CI	<i>SE</i>	<i>z</i>	<i>p</i>	<i>Estimate</i>	95% CI	<i>SE</i>	<i>z</i>	<i>p</i>		
Total effect (c)												
Mindfulness → Anxiety	-7.25	-10.05 -4.45	1.30	-5.59	< .001	-7.87	-11.72 -4.01	1.97	-4.00	< .001		
Indirect effects (ab)												
Mindfulness → Rumination → Anxiety	-0.66	-1.38 0.06	0.37	-1.79	.074	-3.05	-5.24 -0.86	1.12	-2.73	.006		
Mindfulness → Avoidance → Anxiety	-0.60	-1.18 -0.01	0.30	-2.00	.045	-0.27	-1.86 1.32	0.81	-0.33	.742		
Mindfulness → Suppression → Anxiety	0.07	-0.28 0.42	0.18	0.40	.689	-1.06	-2.63 0.51	0.80	-1.32	.186		
Direct effects (c', a, b)												
Mindfulness → Anxiety	-6.07	-8.73 -3.40	1.36	-4.46	< .001	-3.49	-7.64 0.67	2.12	-1.65	.100		
Rumination → Anxiety	0.76	-0.05 1.56	0.41	1.85	.065	5.41	3.33 7.48	1.06	5.11	< .001		
Avoidance → Anxiety	0.91	0.10 1.72	0.41	2.21	.027	0.46	-2.29 3.21	1.40	0.33	.741		
Suppression → Anxiety	-0.20	-1.18 0.78	0.50	-0.40	.687	1.88	-0.76 4.51	1.34	1.40	.163		
Mindfulness → Rumination	-0.87	-1.12 -0.62	0.13	-6.73	< .001	-0.56	-0.91 -0.21	0.18	-3.16	.002		
Mindfulness → Avoidance	-0.65	-0.93 -0.38	0.14	-4.71	< .001	-0.58	-0.88 -0.27	0.16	-3.68	< .001		
Mindfulness → Suppression	-0.36	-0.55 -0.16	0.10	-3.56	< .001	-0.57	-0.85 -0.28	0.15	-3.87	< .001		
Model fit	AIC		BIC		CFI	RMSEA		TLI	SRMR			
	7336.274		7488.854		0.990	0.035		0.935	0.027 0.030			

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion; RMSEA = Root-mean-square error of approximation; CFI = Comparative fit index; TLI = Tucker-Lewis-Index; SRMR = Standardized root-mean-square residual.

Table S4

Multilevel Structural Equation Modeling with Coefficients for Total, Direct and Indirect Effects of Reappraisal, Acceptance, and Problem-Solving on Anxiety Symptoms

	Level 1 (<i>within</i>)						Level 2 (<i>between</i>)					
	<i>Estimate</i>	95% CI		<i>SE</i>	<i>z</i>	<i>p</i>	<i>Estimate</i>	95% CI		<i>SE</i>	<i>z</i>	<i>p</i>
<i>Total effect (c)</i>												
Mindfulness → Anxiety	-7.25	-9.78	-4.71	1.29	-5.60	< .001	-8.08	-11.90	-4.25	1.95	-4.13	< .001
<i>Indirect effects (ab)</i>												
Mindfulness → Reappraisal → Anxiety	-0.61	-1.31	0.08	0.35	-1.73	.083	1.19	-0.97	3.36	1.11	1.08	.280
Mindfulness → Acceptance → Anxiety	-0.57	-1.26	0.13	0.35	-1.60	.111	-6.12	-9.37	-2.87	1.66	-3.69	< .001
Mindfulness → Problem-Solving → Anxiety	-0.11	-0.54	0.32	0.22	-0.50	.617	-0.08	-1.93	1.76	0.94	-0.09	.931
<i>Direct effects (c', a, b)</i>												
Mindfulness → Anxiety	-5.96	-8.62	-3.30	1.36	-4.39	< .001	-3.07	-7.81	1.67	2.42	-1.27	.205
Reappraisal → Anxiety	-0.84	-1.75	0.07	0.46	-1.81	.071	1.70	-1.29	4.68	1.52	1.11	.265
Acceptance → Anxiety	-0.74	-1.61	0.13	0.44	-1.66	.098	-7.74	-10.75	-4.72	1.54	-5.03	< .001
Problem-Solving → Anxiety	-0.25	-1.20	0.71	0.49	-0.50	.614	-0.12	-2.82	2.58	1.38	-0.09	.931
Mindfulness → Reappraisal	0.73	0.49	0.97	0.12	5.91	< .001	0.70	0.42	0.99	0.15	4.84	< .001
Mindfulness → Acceptance	0.77	0.51	1.03	0.13	5.74	< .001	0.79	0.50	1.08	0.15	5.30	< .001
Mindfulness → Problem-Solving	0.44	0.23	0.66	0.11	4.06	< .001	0.68	0.40	0.96	0.14	4.81	< .001
Model fit	AIC		BIC		CFI		RMSEA		TLI		SRMR	
	7448.875		7597.353		0.999		0.018		0.987		0.000 0.016	

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion; RMSEA = Root-mean-square error of approximation; CFI = Comparative fit index; TLI = Tucker-Lewis-Index; SRMR = Standardized root-mean-square residual.

Table S5*Multilevel Structural Equation Modeling with Effects of Study Condition on Emotion Regulation*

Model	<i>Estimate</i>	[95% CI]	<i>SE</i>	<i>z</i>	<i>p</i>
<i>Depressive Symptoms</i>					
Condition → Rumination	0.13	[0.13; 0.96]	0.336	-0.13	.394
Condition → Avoidance	0.12	[0.12; 0.98]	0.329	-0.12	.353
Condition → Suppression	0.03	[0.11; 0.23]	0.820	-0.19	.243
Condition → Reappraisal	0.02	[-0.20; 0.23]	0.11	0.17	.868
Condition → Acceptance	-0.05	[-0.27; 0.18]	0.11	-0.41	.682
Condition → Problem-Solving	-0.10	[-0.31; 0.11]	0.11	-0.93	.354
<i>Anxiety Symptoms</i>					
Condition → Rumination	0.13	[-0.14; 0.39]	0.14	0.93	.353
Condition → Avoidance	0.12	[-0.12; 0.35]	0.12	0.97	.332
Condition → Suppression	0.02	[-0.20; 0.24]	0.11	0.18	.855
Condition → Reappraisal	0.03	[-0.19; 0.24]	0.11	0.25	.806
Condition → Acceptance	-0.06	[-0.27; 0.16]	0.11	-0.50	.617
Condition → Problem-Solving	-0.10	[-0.31; 0.11]	0.11	-0.95	.342

Note. For the MSEM analyses, the study condition was used as a between-person predictor (level 2).

Table S6*Fixed Effect Estimates and Model Fit of Multilevel Growth Analyses for Emotion Regulation Strategies*

Predictor	Rumination		Avoidance		Suppression		Reappraisal		Acceptance		Problem-Solving	
	<i>b</i> [95% CI]	<i>p</i>	<i>b</i> [95% CI]	<i>p</i>	<i>b</i> [95% CI]	<i>p</i>	<i>b</i> [95% CI]	<i>p</i>	<i>b</i> [95% CI]	<i>p</i>	<i>b</i> [95% CI]	<i>p</i>
(Intercept)	5.45*** [4.74; 6.16]		2.96*** [2.29; 3.62]		2.73*** [2.13; 3.33]		2.34*** [1.68, 3.00]		2.26*** [1.59, 2.94]		3.67*** [3.05; 4.28]	
Age	-0.01 [-0.02; 0.00]	.085	0.01 [0.00; 0.02]	.115	0.01 [0.00; 0.02]	.108	0.00 [-0.01, 0.01]	.701	0.00 [-0.01, 0.01]	.717	0.00 [-0.01; 0.01]	.657
Gender	-0.49*** [-0.75, -0.23]	.001	0.08 [-0.16; 0.31]	.504	0.16 [-0.06; 0.37]	.157	0.03 [-0.21, 0.27]	.814	0.27* [0.03, 0.51]	.028	-0.05 [-0.27; 0.17]	.664
Diagnosis	-0.08 [-0.33; 0.17]	.543	0.25* [0.02; 0.48]	.031	-0.02 [-0.24; 0.19]	.848	-0.13 [-0.37, 0.10]	.260	-0.19 [-0.43, 0.04]	.105	-0.19 [-0.41; 0.03]	.082
Time	-0.23*** [-0.31, -0.14]	.001	-0.12** [-0.22, -0.03]	.008	-0.08* [-0.15, -0.01]	.018	0.14** [0.06, 0.22]	.001	0.18*** [0.09, 0.27]	.001	0.11** [0.03; 0.18]	.005
Condition (TAU + M vs. TAU)	-0.26 [-0.68; 0.16]	.223	0.07 [-0.35; 0.49]	.754	0.01 [-0.34; 0.35]	.972	0.02 [-0.38, 0.42]	.919	0.16 [-0.25, 0.58]	.439	0.45* [0.08; 0.81]	.015
Condition (TAU + M vs. TAU + PMR)	-0.24 [-0.66; 0.18]	.252	-0.12 [-0.54; 0.30]	.578	0.00 [-0.34; 0.34]	.999	0.02 [-0.38, 0.42]	.914	0.26 [-0.15, 0.68]	.214	0.23 [-0.13; 0.60]	.201
Time × Condition (TAU + M vs. TAU + PMR)	0.06 [-0.06; 0.17]	.355	-0.09 [-0.21; 0.04]	.179	-0.03 [-0.12; 0.06]	.561	0.00 [-0.12, 0.11]	.988	-0.05 [-0.17, 0.08]	.461	-0.11* [-0.22, -0.01]	.029
Time × Condition (TAU + M vs. TAU + PMR)	0.04 [-0.08; 0.16]	.508	0.01 [-0.12; 0.14]	.898	-0.02 [-0.11; 0.08]	.743	0.01 [-0.11, 0.13]	.842	-0.05 [-0.17, 0.08]	.475	-0.04 [-0.15; 0.06]	.416
AIC	1292.48		1315.00		1063.33		1249.02		1307.20		1140.59	
BIC	1339.48		1361.92		1110.33		1296.02		1354.21		1187.58	
Pseudo-R ² (fixed effects)	0.12		0.06		0.04		0.04		0.06		0.03	
Pseudo-R ² (total)	0.63		0.50		0.65		0.57		0.55		0.59	

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion. * indicates $p < .05$. ** indicates $p < .01$. *** indicates $p < .001$.