

Supplementary Materials

for

Dialectical Behavioural Therapy Improves Emotional Dysregulation Mainly in Binge Eating Disorder and Bulimia Nervosa: A Systematic Review and Meta-analysis

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1. Supplementary figures

Meta-regression					Number of obs	=	31
REML estimate of between-study variance					tau2	=	.09172
% residual variation due to heterogeneity					I-squared_res	=	22.74%
Proportion of between-study variance explained					Adj R-squared	=	23.31%
With Knapp-Hartung modification							
	SMD	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
	BMI	.0384911	.0221322	1.74	0.093	-.0067743	.0837565
	_cons	-1.602501	.7540735	-2.13	0.042	-3.144755	-.060248

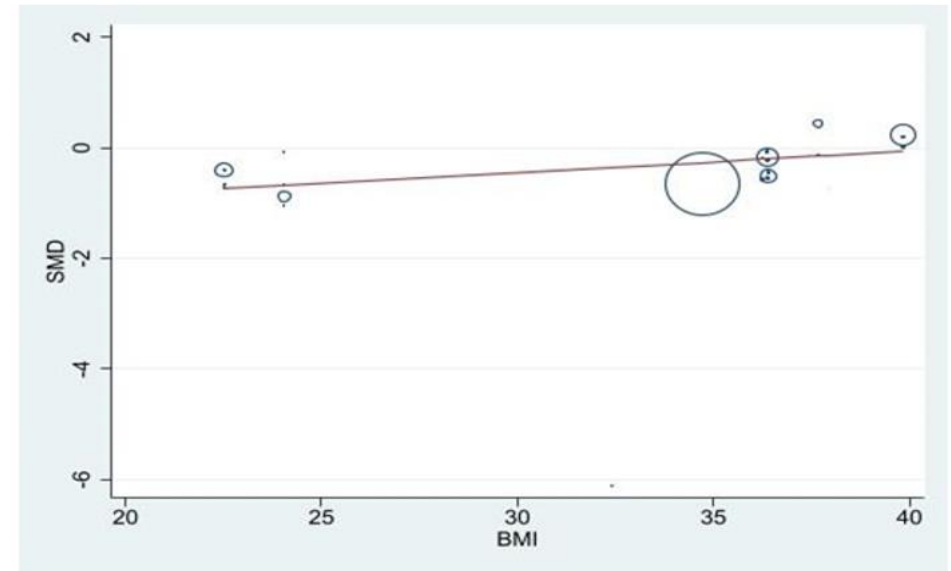


Figure S1. Random effects meta-regression: BMI type as predictor/explanatory variable for the observed effect on emotion regulation

Meta-regression	Number of obs =	36
REML estimate of between-study variance	tau2 =	.1039
% residual variation due to heterogeneity	I-squared_res =	0.00%
Proportion of between-study variance explained	Adj R-squared =	41.39%
With Knapp-Hartung modification		

SMD	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Participantnr	.0077186	.0040511	1.91	0.065	-.0005142	.0159514
_cons	-.6860122	.2834549	-2.42	0.021	-1.262062	-.1099625

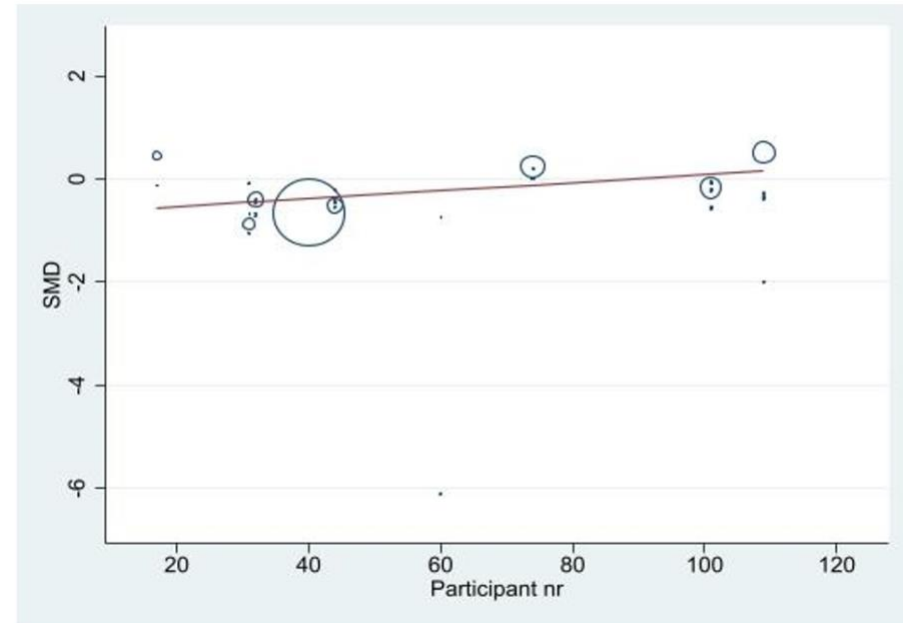


Figure S2. Random effects meta-regression: sample size as predictor/explanatory variable for the observed effect on emotion regulation

metareg SMD Age, wsse (SE) graph

eta-regression
 EML estimate of between-study variance
 residual variation due to heterogeneity
 roportion of between-study variance explained
 ith Knapp-Hartung modification

Number of obs = 35
 tau2 = .1875
 I-squared_res = 0.27%
 Adj R-squared = -15.96%

SMD	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Age	-.0004869	.0154198	-0.03	0.975	-.0318588	.030885
_cons	-.1266283	.6186108	-0.20	0.839	-1.385201	1.131945

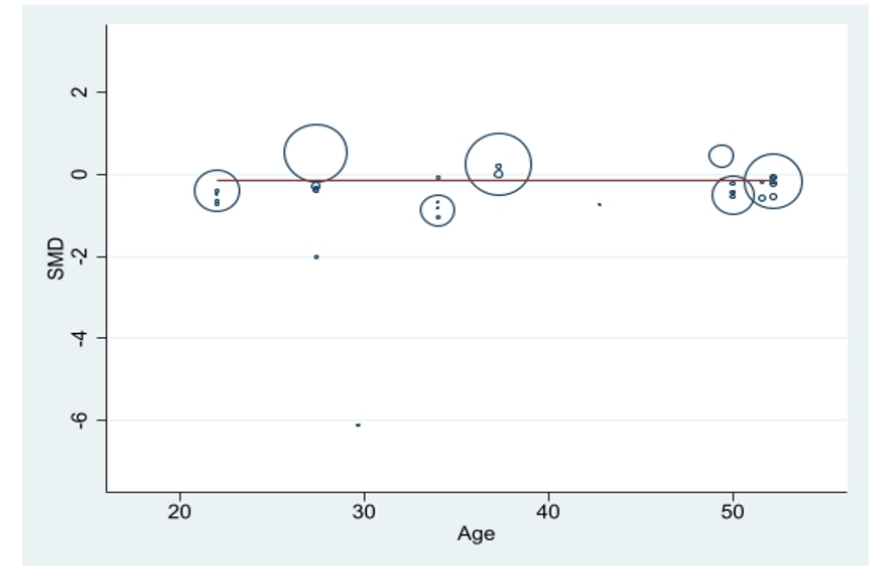


Figure S3. Random effects meta-regression: age as predictor/explanatory variable for the observed effect on emotion regulation

. metareg SMD Country, wsse (SE) graph

Meta-regression
 REML estimate of between-study variance
 % residual variation due to heterogeneity
 Proportion of between-study variance explained
 With Knapp-Hartung modification

Number of obs = 36
 tau2 = .1748
 I-squared_res = 59.88%
 Adj R-squared = 1.42%

SMD	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Country	.3006338	.3149495	0.95	0.347	-.3394206	.9406881
_cons	-.6431704	.4775942	-1.35	0.187	-1.613759	.3274178

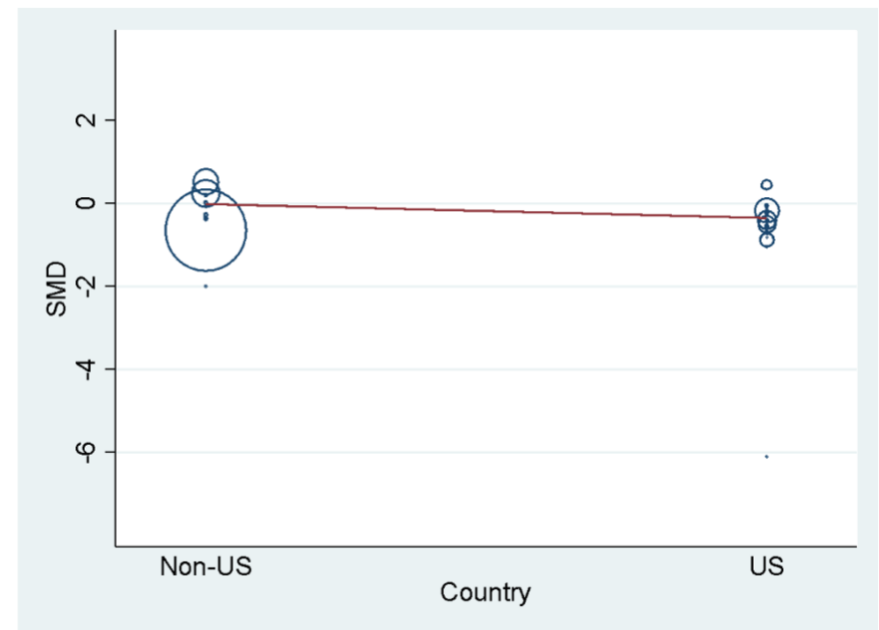


Figure S4. Random effects meta-regression: country (US vs. non-US) as predictor/explanatory variable for the observed effect on emotion regulation

Meta-regression

REML estimate of between-study variance Number of obs = **36**

% residual variation due to heterogeneity tau2 = **.1784**

Proportion of between-study variance explained I-squared_res = **39.21%**

With Knapp-Hartung modification Adj R-squared = **-0.64%**

SMD	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EDcode	.1338565	.2112687	0.63	0.531	-.2954931	.5632061
_cons	-.4165565	.3582028	-1.16	0.253	-1.144512	.3113992

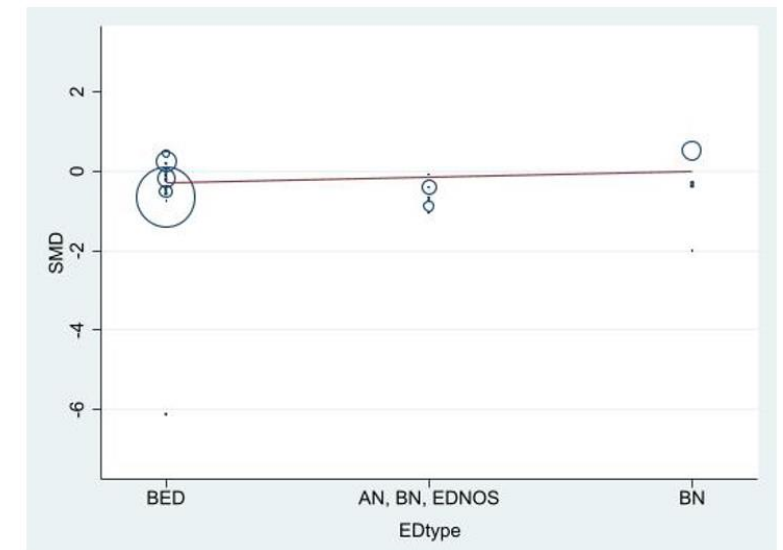


Figure S5. Random effects meta-regression: ED type as predictor/explanatory variable for the observed effect on emotion regulation

. metareg SMD Age BMI, wsse (SE) graph

Meta-regression
 REML estimate of between-study variance
 % residual variation due to heterogeneity
 Proportion of between-study variance explained
 Joint test for all covariates
 With Knapp-Hartung modification

Number of obs = 30
 tau2 = .009706
 I-squared_res = 0.00%
 Adj R-squared = 91.09%
 Model F(2,27) = 5.54
 Prob > F = 0.0096

SMD	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Age	-.021052	.0120397	-1.75	0.092	-.0457553	.0036513
BMI	.0637487	.0194492	3.28	0.003	.0238421	.1036553
_cons	-1.48944	.5050421	-2.95	0.007	-2.525701	-.4531794

Figure S6. Random effects meta-regression: Combination of age & BMI as predictor/explanatory variable for the observed effect on emotion regulation

. metareg SMD Age BMI Participantnr, wsse (SE) graph

Meta-regression
 REML estimate of between-study variance
 % residual variation due to heterogeneity
 Proportion of between-study variance explained
 Joint test for all covariates
 With Knapp-Hartung modification

Number of obs = 30
 tau2 = .04325
 I-squared_res = 0.00%
 Adj R-squared = 60.28%
 Model F(3,26) = 2.28
 Prob > F = 0.1029

SMD	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Age	-.0209287	.0163006	-1.28	0.210	-.0544351	.0125776
BMI	.0667679	.0277627	2.40	0.024	.0097008	.123835
Participantnr	-.0007043	.0052514	-0.13	0.894	-.0114988	.0100901
_cons	-1.555403	.6380935	-2.44	0.022	-2.867023	-.2437825

Figure S7. Random effects meta-regression: Combination of age, BMI & sample size as predictor/explanatory variable for the observed effect on emotion regulation

metareg SMD EDcode BMI, wsse (SE) graph

meta-regression	Number of obs =	31
EML estimate of between-study variance	tau2 =	.02037
residual variation due to heterogeneity	I-squared_res =	0.00%
Proportion of between-study variance explained	Adj R-squared =	82.97%
Joint test for all covariates	Model F(2,28) =	6.92
Wald Knapp-Hartung modification	Prob > F =	0.0036

SMD	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
EDcode	1.963957	.6859409	2.86	0.008	.5588709	3.369043
BMI	.1680242	.0482414	3.48	0.002	.0692061	.2668422
_cons	-8.393939	2.427191	-3.46	0.002	-13.36581	-3.422064

Figure S8. Random effects meta-regression: Combination ED type & BMI as predictor/explanatory variable for the observed effect on emotion regulation

metareg SMD BMI EDcode Age, wsse (SE)

meta-regression	Number of obs =	30
EML estimate of between-study variance	tau2 =	.03645
residual variation due to heterogeneity	I-squared_res =	0.00%
Proportion of between-study variance explained	Adj R-squared =	66.53%
Joint test for all covariates	Model F(3,26) =	2.46
Wald Knapp-Hartung modification	Prob > F =	0.0855

SMD	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
BMI	.0675881	.1122726	0.60	0.552	-.1631915	.2983677
EDcode	.0433803	2.006829	0.02	0.983	-4.081716	4.168476
Age	-.0208993	.0247454	-0.84	0.406	-.0717641	.0299655
_cons	-1.681631	7.068215	-0.24	0.814	-16.21055	12.84729

Figure S9. Random effects meta-regression: Combination of BMI, ED type & age as predictor/explanatory variable for the observed effect on emotion regulation

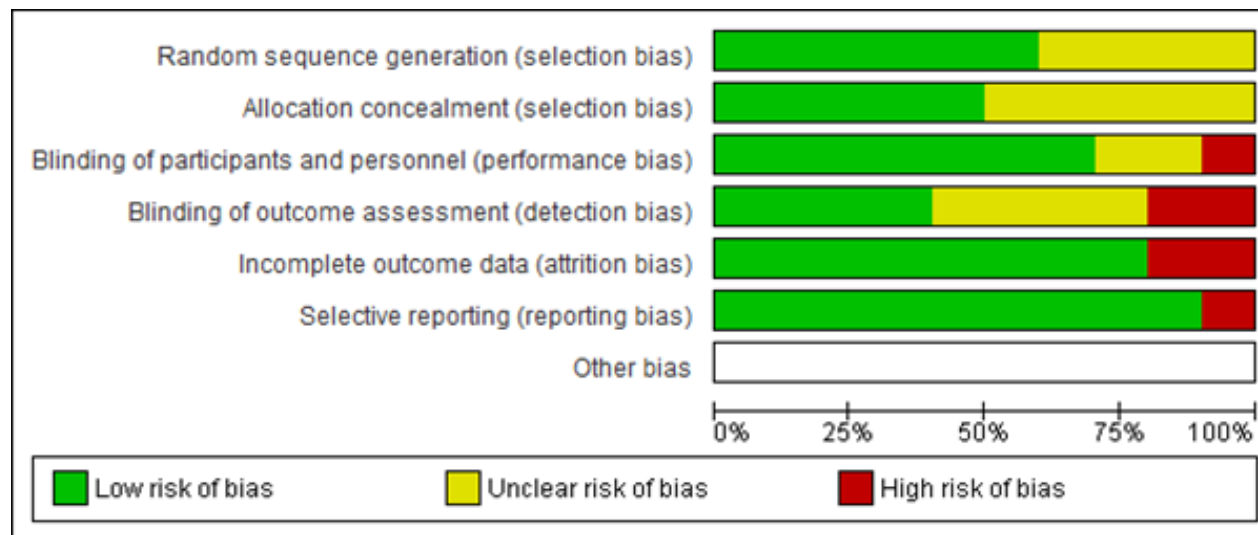


Figure S10. Quality assessment: an overview by bias domain

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Adler 2008	?	?	+	+	+	+	
Dastan 2019	+	+	+	+	+	+	
Hill 2007	+	?	-	-	+	+	
Hoffman 2006	?	?	+	?	-	+	
Lammers 2020	+	+	+	+	+	+	
Masson 2013	+	+	+	+	+	+	
Rahmani 2018	+	+	+	?	+	+	
Safer 2001	+	+	?	?	+	-	
Safer 2010	?	?	+	?	+	+	
Telch 2001	?	?	?	-	-	+	

Figure S11. Quality assessment: an overview by study

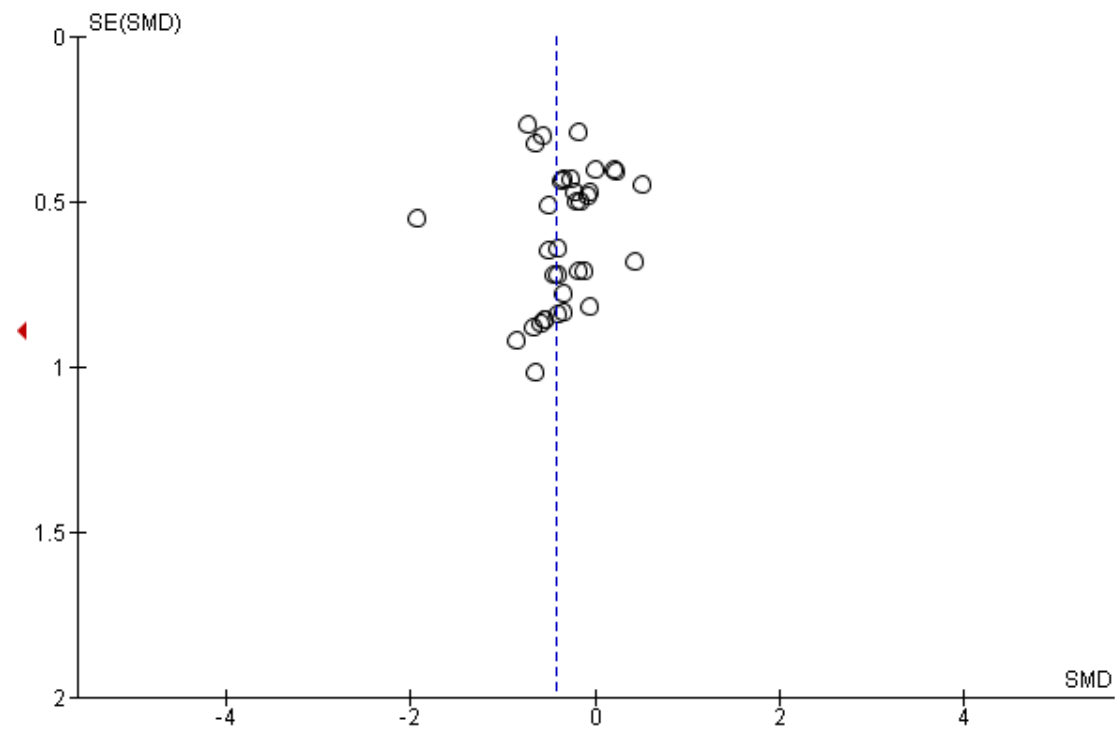


Figure S12. Funnel plot: overall emotion regulation

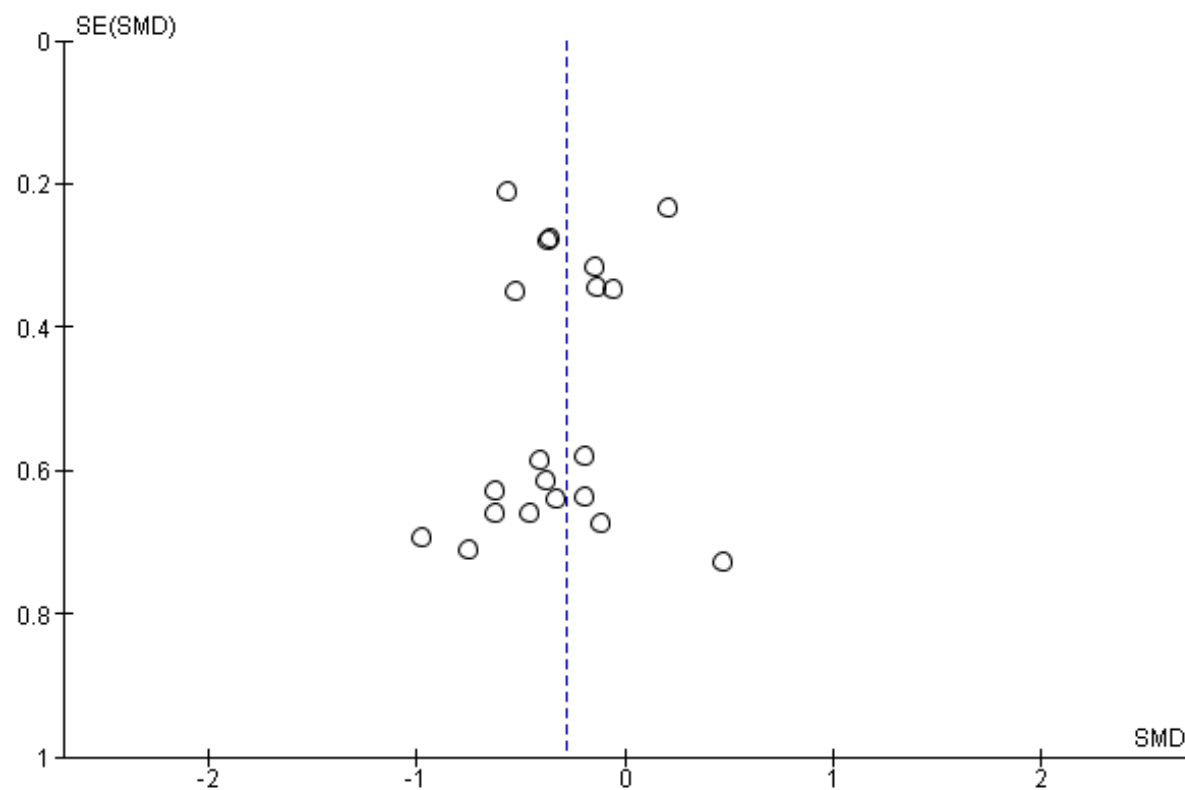


Figure S13. Funnel plot: depressive symptoms

2. Supplementary tables

Table S1. Search terms used in the systematic search

Query	Results
("anorexi*" OR "anorexia nervosa" OR "bulimi*" OR "bulimia nervosa" OR "eating disorder*" OR "binge-eating disorder" OR “feeding disorder” OR “OSFED” OR "EDNOS" OR “UFED” OR “ARFID” OR “orthorexia”) AND ("dialectic behavior therapy" OR "dialectic behaviour therapy" OR "dialectical behavior therapy" OR "dialectical behaviour therapy" OR "dialectic behavioral therapy" OR "dialectic behavioural therapy" OR "dialectical behavioral therapy" OR "dialectical behavioural therapy")	535

Table S2. Subgroup analysis results by comparison, non-adjusted

Subgroup analysis AT vs WL results															
Outcome	Number of studies	(n)		MD/SMD		95 % CI		p-value		Heterogeneity (I ²)		p-value for I ²		p-value for subgroup test	I ² for subgroup test
		AT	WL	AT	WL	AT	WL	AT	WL	AT	WL	AT	WL		
Overall emotion regulation	36 / 11	1592	685	-0.23	-0.78	[-0.46, 0.01]	[-1.14, -0.42]	0.06	<0.0001	80%	80%	<0.00001	<0.00001	0.01	84.70%
Eating emotion regulation	8	301	145	0.22	-0.6	[-0.13, 0.57]	[-0.93, -0.26]	0.22	0.0005	52%	0%	0.1	0.82	0.001	90.80%
General emotion regulation	10 / 9	477	225	-0.16	-1.62	[-0.34, 0.02]	[-2.95, -0.28]	0.09	0.02	0%	94%	0.89	<0.00001	0.03	77.80%
Depressive symptoms	19 / 9	722	416	-0.24	-0.51	[-0.43, -0.05]	[-0.71, -0.31]	0.01	<0.0001	35%	0%	0.14	0.75	0.05	73.60%
Objective binge episodes	8	285	165	-0.13	-0.4	[-0.35, 0.09]	[-0.65, -0.14]	0.26	0.002	84%	81%	0.0003	0.001	0.12	59%
Severity of symptoms	8 / 7	192	240	-0.27	-1.24	[-0.87, 0.32]	[-1.91, -0.56]	0.37	0.0003	71%	82%	0.03	0.0002	0.04	77.30%
BMI	5	196	129	-0.33	-2.77	[-2.72, 2.06]	[-5.36, -0.18]	0.78	0.04	0%	56%	0.92	0.1	0.18	45.60%

Table S3. Subgroup analysis results by gender, non-adjusted

Subgroup analysis Females only (F) vs Females and males (F&M) results															
Outcome	Number of studies	participants (n)		MD/SMD		95 % CI		p-value		Heterogeneity (I ²)		p-value for I ²		p-value for subgroup test	I ² for subgroup test
		F	F&M	F	F&M	F	F&M	F	F&M	F	F&M	F	F&M		
Overall emotion regulation	36 / 11	1170	1107	-0.72	-0.18	[-1.05, -0.38]	[-0.33, -0.03]	<0.0001	0.02	86%	34%	<0.0001	0.1	0.004	87.70%
Eating emotion regulation	8	254	192	-0.35	0.06	[-0.93, 0.24]	[-0.28, 0.40]	0.24	0.73	79%	21%	0.0008	0.28	0.42	0%
General emotion regulation	10 / 9	274	428	-1.51	-0.21	[-2.81, -0.21]	[-0.43, 0.01]	0.02	0.06	95%	24%	<0.0001	0.26	0.05	73.30%
Depressive symptoms	19 / 9	573	504	-0.44	-0.18	[-0.61, -0.27]	[-0.43, 0.08]	<0.0001	0.17	0%	47%	0.89	0.08	0.1	64.10%
Objective binge episodes	8	105	345	-0.45	-0.14	[-0.79, -0.10]	[-0.31, 0.03]	0.01	0.12	86%	81%	0.0007	0.0003	0.12	59%
Severity of symptoms	8 / 7	180	252	-1.35	-0.43	[-2.25, -0.46]	[-0.97, 0.10]	0.003	0.11	86%	74%	0.0001	0.009	0.08	66.60%
BMI	6	129	270	-2.77	-0.97	[-5.36, -0.18]	[-2.83, 0.88]	0.04	0.31	56%	0%	0.1	0.71	0.27	18.50%

Table S4. Subgroup analysis results by ED type, non-adjusted

Subgroup analysis BED vs miscellaneous EDs results															
Outcome	Number of studies	participants (n)		MD/SMD		95 % CI		p-value		Heterogeneity (I ²)		p-value for I ²		p-value for subgroup test	I ² for subgroup test
		BED	Misc. EDs	BED	Misc. EDs	BED	Misc. EDs	BED	Misc. EDs	BED	Misc. EDs	BED	Misc. EDs		
Overall emotion regulation	36 / 11	1427	850	-0.4	-0.56	[-0.66, -0.14]	[-0.90, -0.22]	0.003	0.001	82%	81%	<0.0001	<0.00001	0.45	0%
Eating emotion regulation	8	276	170	-0.16	-0.21	[-0.52, 0.20]	[-1.09, 0.68]	0.39	0.65	50%	84%	0.09	0.002	0.92	0%
General emotion regulation	10 / 9	564	138	-0.84	-0.44	[-1.49, -0.19]	[-0.94, 0.05]	0.01	0.08	92%	36%	<0.0001	0.21	0.34	0%
Depressive symptoms	19 / 9	676	465	-0.22	-0.53	[-0.39, -0.05]	[-0.72, -0.34]	0.01	<0.0001	18%	0%	0.27	0.74	0.02	82.30%
Objective binge episodes	8	389	61	-0.15	-0.55	[-0.30, -0.01]	[-1.11, 0.01]	0.04	0.05	78%	91%	0.0005	0.0009	0.18	44.60%

Table S5. Subgroup analysis results by prioritization of ER, non-adjusted

Subgroup analysis primary ER (prim) vs. secondary ER (sec) results															
Outcome	Number of studies	participants (n)		MD/SMD		95 % CI		p-value		Heterogeneity (I ²)		p-value for I ²		p-value for subgroup test	I ² for subgroup test
		Prim ER	Sec ER	Prim ER	Sec ER	Prim ER	Sec ER	Prim ER	Sec ERR	Prim ER	Sec ER	Prim ER	Sec ER		
Overall emotion regulation	36 / 11	1147	1130	-0.62	-0.33	[-1.04, -0.20]	[-0.46, -0.21]	0.004	<0.0001	91%	7%	<0.0001	0.37	0.2	39.50%
Eating emotion regulation	8	267	179	-0.06	-0.28	[-0.61, 0.49]	[-0.70, 0.15]	0.83	0.2	79%	39%	0.003	0.18	0.54	0%
General emotion regulation	10 / 9	347	355	-1.35	-0.23	[-2.48, -0.22]	[-0.44, -0.02]	0.02	0.03	95%	0%	<0.0001	0.49	0.06	72.50%
Depressive symptoms	19 / 9	419	613	-0.22	-0.4	[-0.43, -0.02]	[-0.60, -0.21]	0.03	<0.0001	0%	23%	0.58	0.22	0.2	38.20%
BMI	5	201	124	-2.26	-0.76	[-4.89, 0.36]	-3.60, 2.09]	0.09	0.6	67%	0%	0.05	0.57	0.45	0%

Table S6. Subgroup analysis results by comparison, adjusted

Subgroup analysis AT vs WL results (adjusted)															
Outcome	Number of studies	Participants (n)		MD/SMD		95 % CI		p-value		Heterogeneity (I ²)		p-value for I ²		p-value for subgroup test	I ² for subgroup test
		AT	WL	AT	WL	AT	WL	AT	WL	AT	WL	AT	WL		
Overall emotion regulation	11	346	313	-0.2	-0.83	[-0.41, 0.01]	[-1.47, -0.20]	0.06	0.01	6%	77%	0.38	<0.00001	<0.01	86.50%
General emotion regulation	9	376	225	-0.16	-1.62	[-0.36, 0.04]	[-2.95, -0.28]	0.12	0.02	0%	94%	0.91	<0.01	0.03	77.60%
Depressive symptoms	9	394	145	-0.25	-0.39	[-0.45, 0.04]	[-0.73, 0.06]	0.02	0.02	5%	0%	0.4	0.99	0.46	0%
Severity of symptoms	7	192	196	-0.27	-1.14	[-0.87, 0.32]	[-1.70, -0.32]	0.37	<0.01	71%	66%	0.03	0.02	0.04	77%

Table S7. Subgroup analysis results by gender, adjusted

Subgroup analysis Females only vs Females and males results (adjusted)															
Outcome	Number of studies	Participants (n)		MD/SMD		95 % CI		p-value		Heterogeneity (I ²)		p-value for I ²		p-value for subgroup test	I ² for subgroup test
		Females	Females & males	Females	Females & males	Females	Females & males	Females	Females & males	Females	Females & males	Females	Females & males		
Overall emotion regulation	11	346	312	-0.74	-0.24	[-1.29, -0.20]	[-0.46, -0.03]	0.008	0.03	77%	0%	<0.00001	0.77	0.07	69.70%
General emotion regulation	9	274	327	-1.51	-0.23	[-2.81, -0.21]	[-0.47, 0.02]	0.02	0.07	95%	20%	<0.01	0.29	0.06	72.40%
Depressive symptoms	9	254	285	-0.38	-0.19	[-0.63, -0.13]	[-0.47, 0.10]	<0.01	0.2	0%	24%	1	0.25	0.32	0%
Severity of symptoms	7	136	252	-1.26	-0.43	[-2.03, -0.50]	[-0.97, 0.10]	0.001	0.11	72%	74%	0.01	0.009	0.08	67.10%

Table S8. Subgroup analysis results by ED type, adjusted

Subgroup analysis BED vs other types of ED results															
Outcome	Number of studies	Participants (n)		MD/SMD		95 % CI		p-value		Heterogeneity (I ²)		p-value for I ²		p-value for subgroup test	I ² for subgroup test
		BED	Misc. EDs	BED	Misc. EDs	BED	Misc. EDs	BED	Misc. EDs	BED	Misc. EDs	BED	Misc. EDs		
Overall emotion regulation	11	489	420	-0.48	-0.42	[-0.91, -0.05]	[-0.74, -0.10]	0.03	0.01	79%	0%	<0.00001	0.52	0.84	0%
General emotion regulation	9	431	170	-0.94	-0.4	[-1.75, -0.14]	[-0.71, -0.09]	0.02	0.01	93%	0%	<0.00001	0.45	0.22	34.2 %
Depressive symptoms	9	676	170	-0.22	-0.46	[-0.39, -0.05]	[-0.77, -0.15]	0.01	0.004	18%	0%	0.27	0.99	0.2	39.60%

Table S9. Subgroup analysis results by prioritization of ER, adjusted

Subgroup analysis primary ER vs. secondary ER results															
Outcome	Number of studies	Participants (n)		MD/SMD		95 % CI		p-value		Heterogeneity (I ²)		p-value for I ²		p-value for subgroup test	I ² for subgroup test
		Primary ER	Secondary ER	Primary ER	Secondary ER	Primary ER	Secondary ER	Primary ER	Secondary ER	Primary ER	Secondary ER	Primary ER	Secondary ER		
Overall emotion regulation	10	387	272	-0.68	-0.3	[-1.27, -0.09]	[-0.54, -0.05]	0.02	0.02	85%	0%	<0.00001	1	0.83	0%
General emotion regulation	9	347	254	-1.35	-0.27	[-2.48, -0.22]	[-0.52, -0.02]	0.02	0.03	95%	0%	<0.0001	0.56	0.07	70.30%
Depressive symptoms	9	267	272	-0.17	-0.41	[-0.41, 0.08]	[-0.65, -0.16]	0.18	0.001	0%	0%	0.69	0.93	0.17	45.80%