

Supplement:

Standalone Smartphone Apps for Mental Health – A Systematic Review and Meta-Analysis

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Supplementary Figure 1: Risk of bias plot over all studies

Supplementary Figure 2: Risk of bias plot per study

Supplementary Figure 3: Forest plot of pooled mean effect anxiety

Supplementary Figure 4: Forest plot of pooled mean effect depression over all studies

Supplementary Figure 5: Forest plot of pooled mean effect anxiety over all studies

Supplementary Figure 6: Forest plot of pooled mean effect substance use: smoking

Supplementary Figure 7: Forest plot of pooled mean effect substance use: alcohol use

Supplementary Figure 8: Forest plot of pooled mean effect substance use

Supplementary Figure 9: Forest plot of pooled mean effect self-injury

Supplementary Figure 10: Forest plot of pooled mean effect suicidal ideation

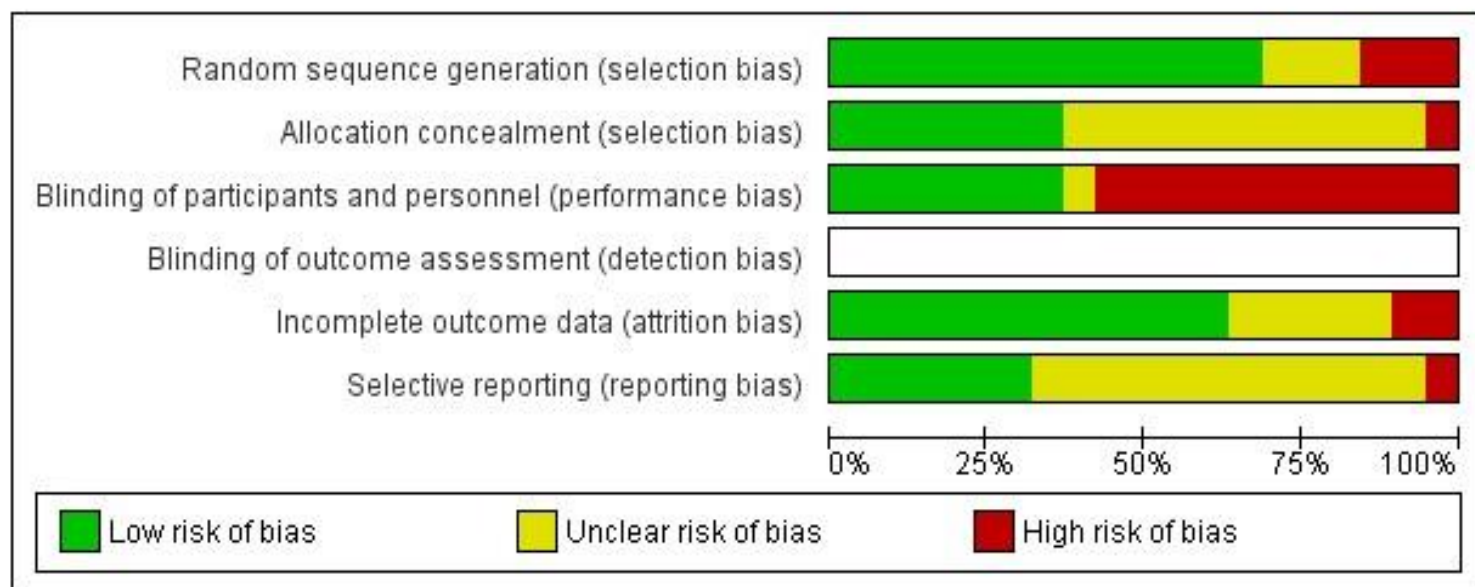
Supplementary Table 1: Risk of bias overview

Supplementary Table 2: Outcome overview by study between-group post-assessment

Supplementary Methods: Search String Pubmed

Supplementary References: Overview of included studies

Supplementary Figure 1: Risk of bias plot over all studies



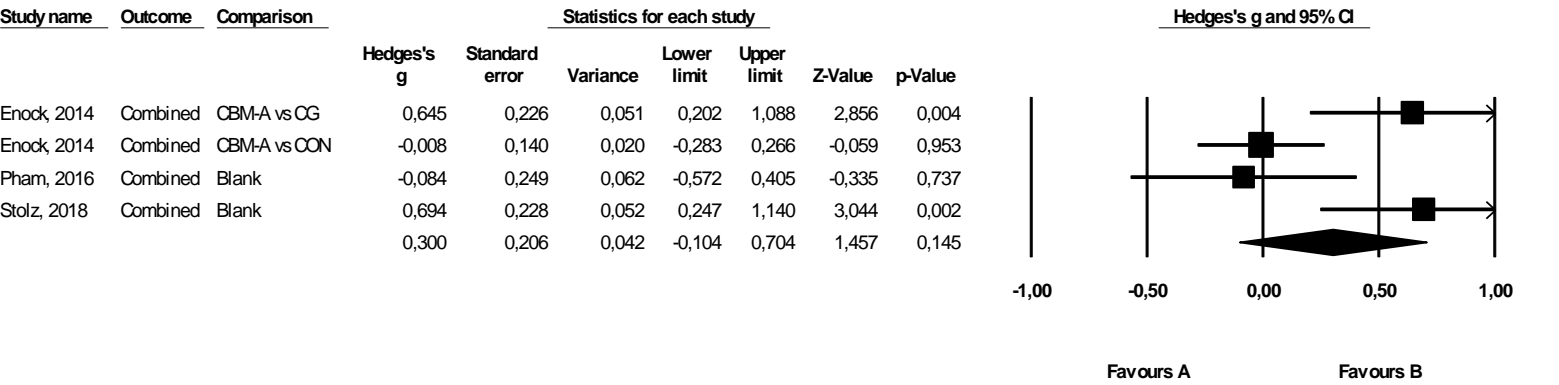
Risk of bias plot over all studies

Supplementary Figure 2: Risk of bias plot per study

	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)
Areal, 2016	-	-	+		+	-
BinDhim, 2016	+	+	+		+	+
Birney, 2016	+	+	?		?	+
Clarke, 2016	?	?	+		?	?
Dar, 2017	-	?	-		?	?
Enock, 2014	-	?	-		?	?
Franklin, 2016 Study 1	+	?	+		+	?
Franklin, 2016 Study 2	+	?	+		+	?
Franklin, 2016 Study 3	+	?	+		+	?
Gajecki, 2014	+	+	-		-	?
Horsch, 2017	+	+	-		+	+
Hur, 2018	+	?	+		-	?
Kuhn, 2017	+	?	-		+	?
Miner, 2016	?	?	-		+	?
Pham, 2016	+	?	-		?	+
Roepke, 2015	+	+	-		+	?
Stolz, 2018	+	+	-		+	+
Tighe, 2017	+	+	-		+	+
Witkiewitz, 2014	?	?	-		+	?

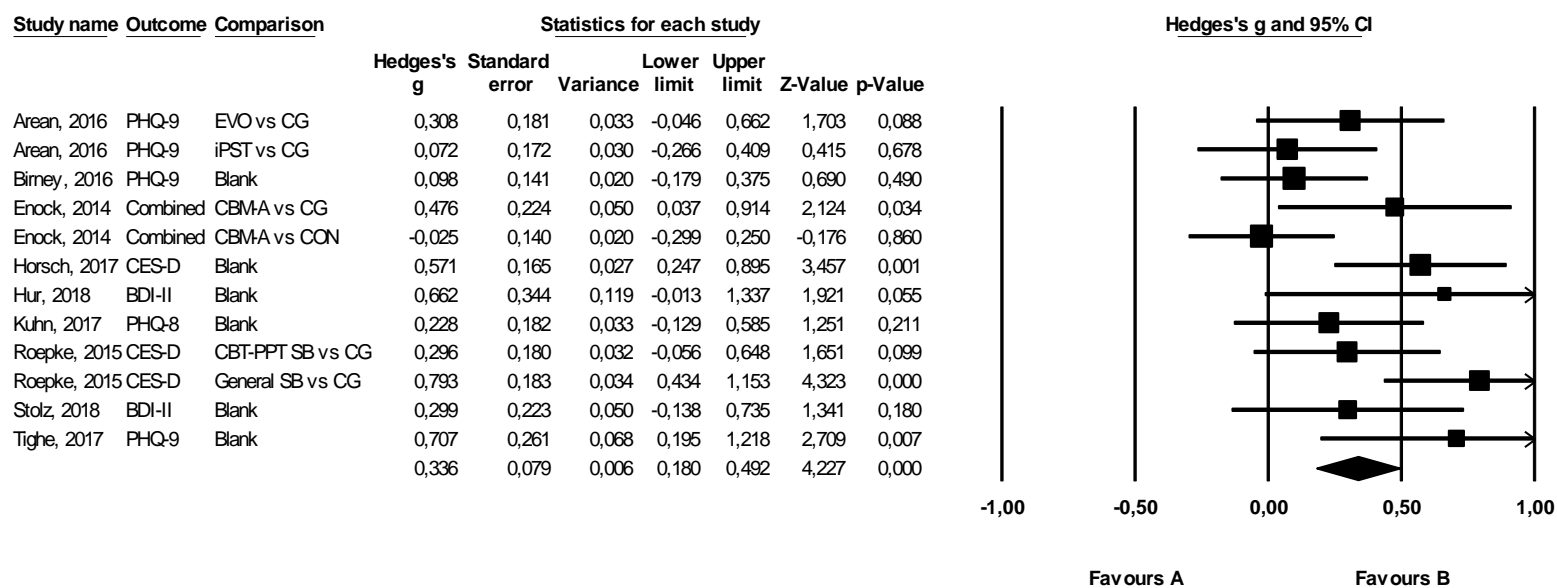
Risk of bias plot per study

Supplementary Figure 3: Forest plot of pooled mean effect anxiety



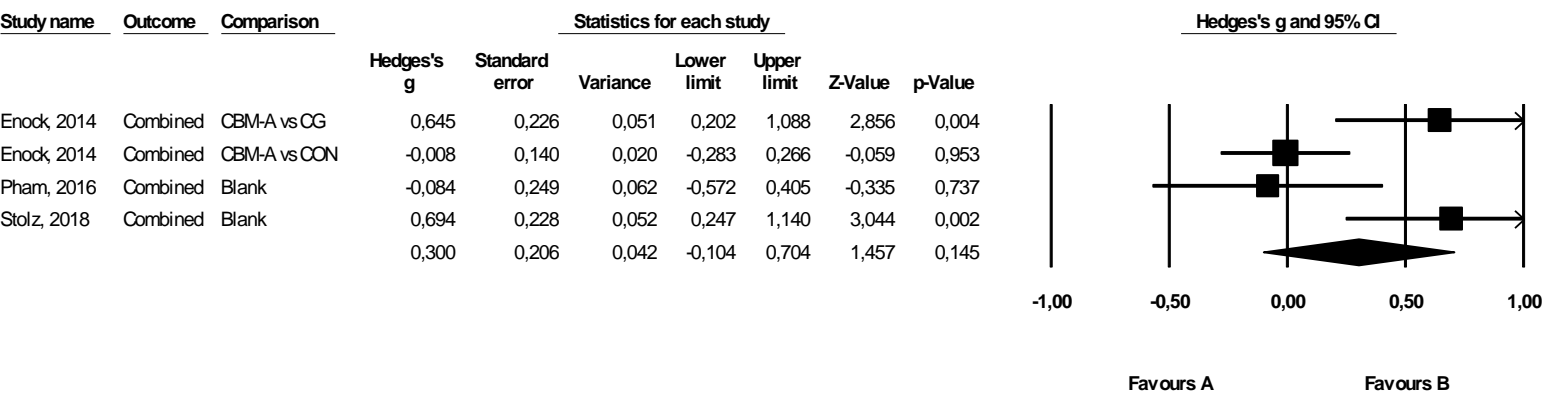
Forest plot of pooled mean effect anxiety

Supplementary Figure 4: Forest plot of pooled mean effect depression over all studies



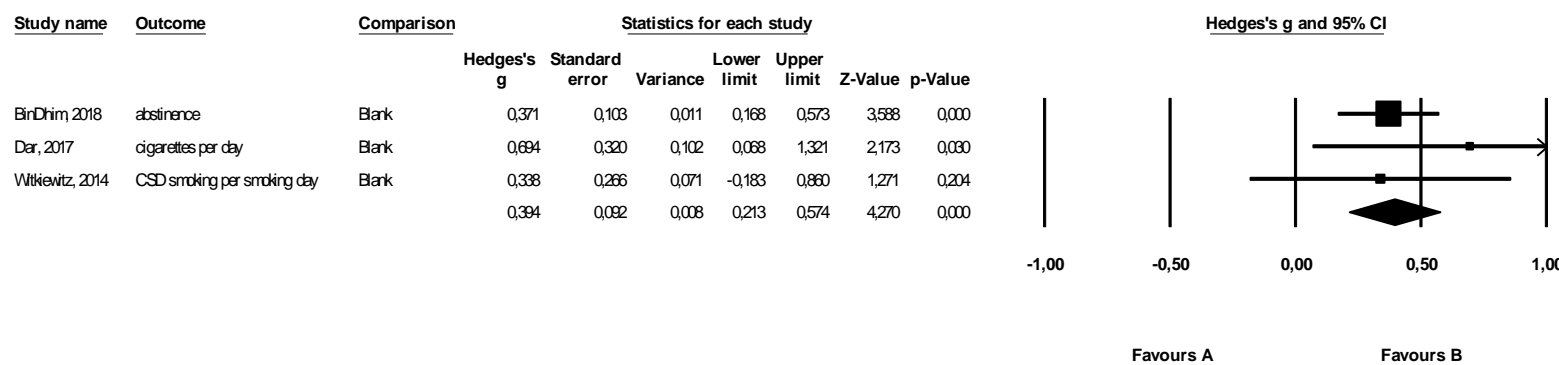
Forest plot of pooled mean effect depression over all studies

Supplementary Figure 5: Forest plot of pooled mean effect anxiety over all studies



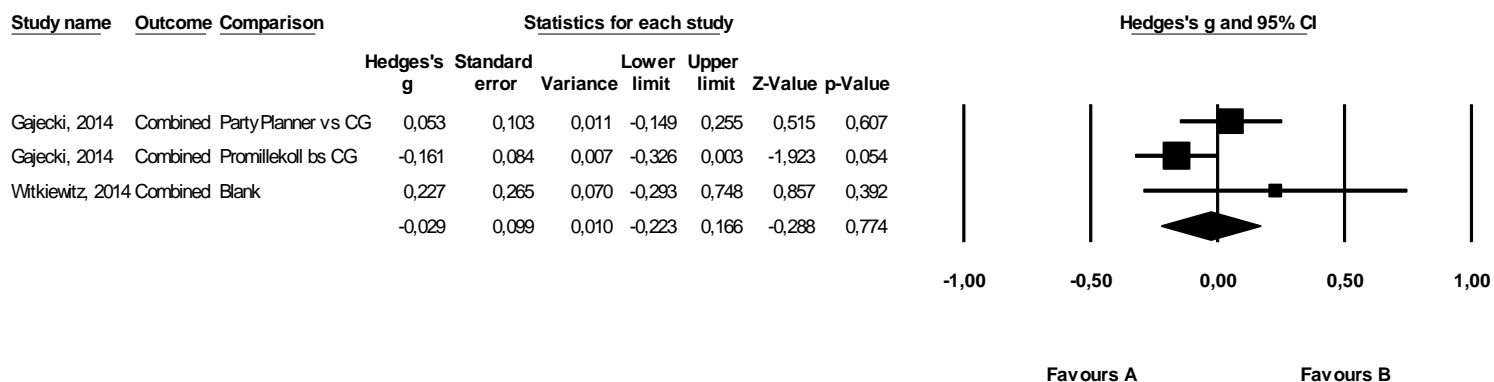
Forest plot of pooled mean effect anxiety over all studies

Supplementary Figure 6: Forest plot of pooled mean effect substance use: smoking



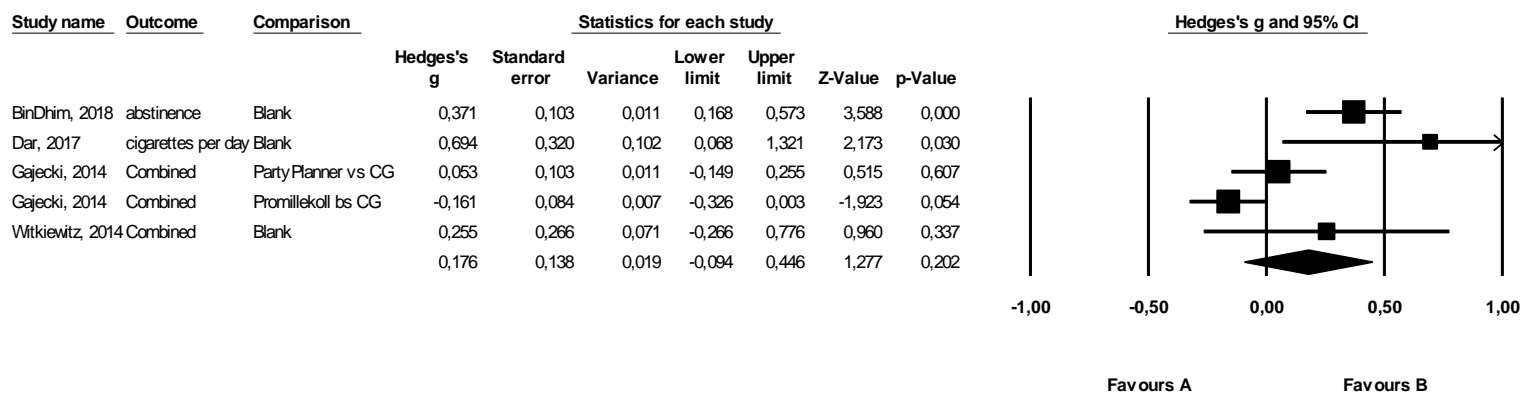
Forest plot of pooled mean effect substance use: smoking

Supplementary Figure 7: Forest plot of pooled mean effect substance use: alcohol use



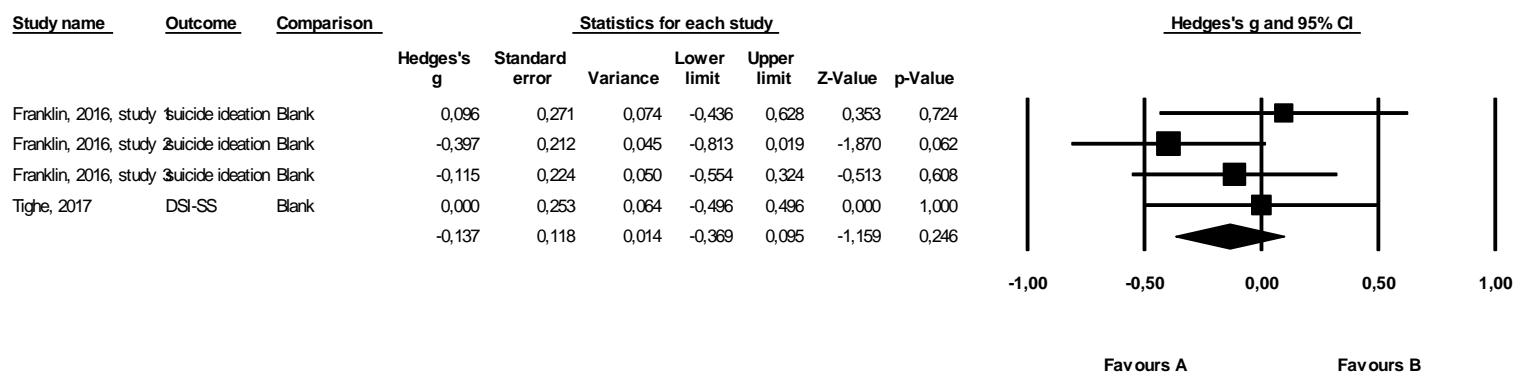
Forest plot of pooled mean effect substance use: alcohol use

Supplementary Figure 8: Forest plot of pooled mean effect substance use



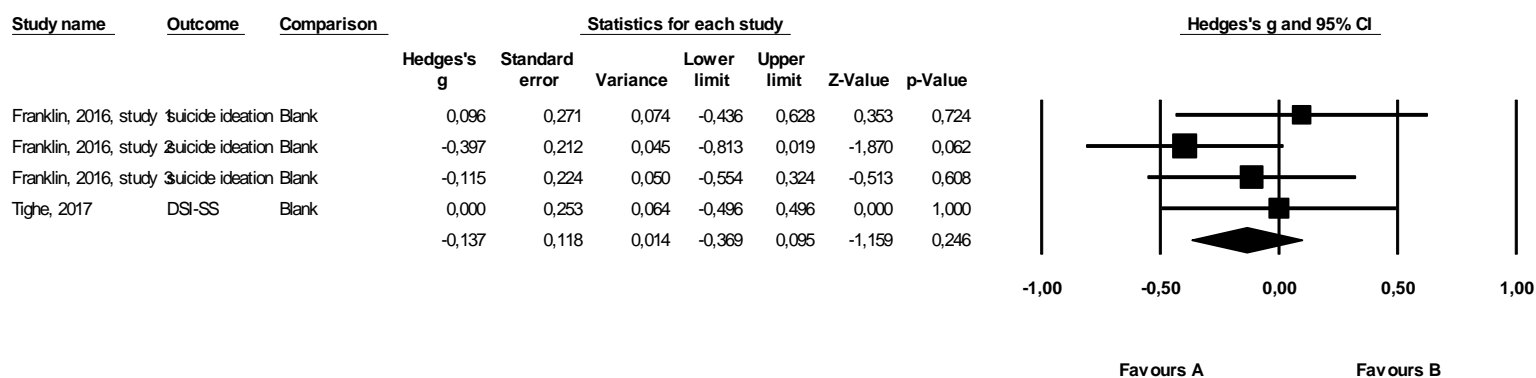
Forest plot of pooled mean effect substance use

Supplementary Figure 9: Forest plot of pooled mean effect self-injury



Forest plot of pooled mean effect self-injury

Supplementary Figure 10: Forest plot of pooled mean effect suicidal ideation



Forest plot of pooled mean effect suicidal ideation

Supplementary Table 1: Risk of bias overview

Trials	Sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessors	Incomplete outcome data	Selective reporting	Other sources of bias
Arean 2016	2	2	0	NA	0	2	Study registration does not match the study High dropout
BinDhim 2016	0	0	0	NA	0	0	
Birney 2016	0	0	1	NA	1	0	
Clarke 2016	1	1	0	NA	1	1	
Dar 2017	2	1	2	NA	1	1	
Enock 2014	2	1	2	NA	1	1	Waitlist came into the study late, study design unclear
Franklin 2016 Study 1	0	1	0	NA	0	1	
Franklin 2016 Study 2	0	1	0	NA	0	1	
Franklin 2016 Study 3	0	1	0	NA	0	1	
Gajecki 2014	0	0	2	NA	2	1	
Horsch 2017	0	0	2	NA	0	0	
Hur 2018	0	1	0	NA	2	1	
Kuhn 2017	0	1	2	NA	0	1	
Miner 2016	1	1	2	NA	0	1	
Pham 2016	0	1	2	NA	1	0	
Roepke 2015	0	0	2	NA	0	1	High dropout
Stolz 2018	0	0	2	NA	0	0	
Tighe 2017	0	0	2	NA	0	0	
Witkiewitz 2014	1	1	2	NA	0	1	

0 = low risk, 1 = unclear risk, 2 = high risk, NA = not applicable

Supplementary Table 2: Outcome overview by study between-group post-assessment

Author year	Outcome ¹	Comparison	Sample size	Hedges' g	95% CI	P
Arean 2016	Depression	EVO vs CG	129	0.31	-0.05-0.66	.088
		iPST vs CG	150	0.07	-0.27-.41	.678
BinDhim 2018	Substance use: smoking	-	684	0.37	0.17-0.57	≤.001
Birney 2016 ²	Depression	-	199	0.1	-0.18-0.38	.49
Clarke 2016 ³	Sleep problems	-	36	0.84	0.17-1.51	.014
Dar 2017	Substance use: smoking	-	40	0.69	.07-1.32	.03
Enock 2014	Social anxiety	CBM-A vs CG 1	106	0.65	0.2-1.09	.004
		CBM-A vs CG 2	220	-0.01	-0.28-0.27	.953
	Depression	CBM-A vs CG 1	106	0.48	0.04-0.91	.034
		CBM-A vs CG 2	220	-0.03	-0.3-0.25	.86
Franklin 2016 Study 1	Self-injury	-	54	-0.09	-0.62-0.45	.75
	Suicidal ideation	-	54	0.1	-0.44-0.63	.724
Franklin 2016 Study 2	Self-injury	-	90	-0.11	-0.52-0.31	.61
	Suicidal ideation	-	90	-0.4	-0.81-0.02	.062
Franklin 2016 Study 3	Self-injury	-	81	0.06	-0.38-0.5	.79
	Suicidal ideation	-	81	-0.12	-0.55-0.32	.608
Gajecki 2014	Substance use: drinking	PartyPlanner vs CG	398	0.05	-0.15-0.26	.607
		Promillekoll vs CG	586	-0.16	-0.33-0.00	.054
Horsch 2017	Sleep problems	-	151	0.72	0.39-1.05	≤.001
	Depression	-	151	0.57	0.25-0.9	≤.05
	Anxiety	-	151	0.65	0.32-0.97	≤.001
Hur 2018	Depression	-	34	0.66	-0.01-1.34	.055
	Anxiety	-	34	0.74	0.06-1.42	.034
Kuhn 2017	PTSD	-	120	0.14	-0.22-0.5	0.439
	Depression	-	120	0.23	-0.13-0.59	.211
Miner 2016	PTSD	-	49	-0.05	-0.6-0.51	.87
Pham 2016	Anxiety	-	63	-0.08	-0.57-0.41	.737
Roepke 2015	Depression	CBT-PPT SB vs CG	140	0.3	-0.06-0.65	.099
		General SB vs CG	144	0.79	0.43-1.15	≤.001
	Anxiety	CBT-PPT SB vs CG	140	0.28	-0.07-0.64	.113
		General SB vs CG	144	0.64	0.28-0.99	≤.001
Stolz 2018	Social anxiety	-	90	0.69	0.19-0.66	.002
	Depression	-	90	0.3	-0.14-0.74	.18
Tighe 2017	Suicidal ideation	-	61	0	-0.5-0.5	1
	Depression	-	61	0.71	0.2-1.22	0.007
Witkiewitz 2014	Substance use: drinking	-	56	0.23	-0.29-0.75	.392
	Substance use: smoking	-	56	0.34	-0.18-0.86	.204

¹Primary outcome in **bold**

²True sample size between 199-209 discrepancy could not be clarified based on original data

³n=36 used in analysis although true sample size was n=35, as unclear in which condition the one missing participant was

Supplementary Methods: Search String Pubmed

Short Description: Search String for PubMed Search sorted by Best Match

Mesh Terms for mobile applications, mental disorders and health, 3 thematic blocks: mhealth, disorders, and study type

Restrictions: Language English or German, Publication Date from January 2007

(mobile applications[MeSH Terms] OR mobile health[Title]OR mhealth[Title]OR m-health[Title]OR app[Title]OR app-based[Title]OR mobile[Title]OR mobile application[Title]OR mobile-based[Title]OR phone-based[Title]OR medical informatics application[Title]OR smartphone[Title]OR smartphone-based[Title] OR pda[Title]OR personal digital assistance[Title]OR tablet[Title])

AND

(mental disorders[MeSH Terms] OR mental health[MeSH Terms] OR mental disorder[Title/Abstract]OR mental disorders[Title/Abstract]OR mental illness* mental disorder[Title/Abstract]OR mental disorders[Title/Abstract]OR mental illness*[Title/Abstract]OR mental health[Title/Abstract]OR psychological health[Title/Abstract]OR CMHD[Title/Abstract]OR mental[Title/Abstract]OR mentally ill[Title/Abstract]OR mental distress[Title/Abstract]OR mental illness[Title/Abstract]OR psychiatric disorder[Title/Abstract]OR psychotic disorders[Title/Abstract]OR affective disorders[Title/Abstract]OR depress*[Title/Abstract]OR anxi*[Title/Abstract]OR anxiety disorder*[Title/Abstract]OR stress*[Title/Abstract]OR stress disorders[Title/Abstract]OR dysthymic disorder[Title/Abstract]OR persistent depressive disorder[Title/Abstract]OR neurotic disorder[Title/Abstract]OR bipolar disorder[Title/Abstract]OR seasonal affective disorder[Title/Abstract]OR mood[Title/Abstract]OR panic[Title/Abstract]OR panic disorder[Title/Abstract]OR agoraphob*[Title/Abstract]OR phobi* [Title/Abstract]OR specific phobi*[Title/Abstract]OR simple phobi*[Title/Abstract]OR phobic[Title/Abstract]OR disorder[Title/Abstract]OR social anxi*[Title/Abstract]OR general* anxi*[Title/Abstract]OR obsess* compuls*[Title/Abstract]OR impulse control disorder*[Title/Abstract]OR somatoform disorders[Title/Abstract]OR somatoform[Title/Abstract]OR sleep disorder*[Title/Abstract]OR sleep disturbance[Title/Abstract]OR sleep problem[Title/Abstract]OR insomnia[Title/Abstract]OR schizophreni*[Title/Abstract]OR psychotic[Title/Abstract]OR psychosis[Title/Abstract]OR psychotrauma[Title/Abstract]OR traumatic[Title/Abstract]OR bipolar [Title/Abstract] OR mania[Title/Abstract]OR self-harm[Title/Abstract]OR suicid*[Title/Abstract]OR addic*[Title/Abstract]OR addiction[Title/Abstract]OR automutilation[Title/Abstract]OR self-injurious behavio*[Title/Abstract]OR smoking cessation[Title/Abstract]OR tobacco use[Title/Abstract]OR gambling[Title/Abstract]OR substance use[Title/Abstract]OR substance-related disorder*[Title/Abstract]OR alcohol-related disorder*[Title/Abstract]OR alcohol abuse alcohol depend*[Title/Abstract]OR alcohol misuse[Title/Abstract]OR medication[Title/Abstract]OR personality attention-deficit[Title/Abstract]OR social[Title/Abstract]OR body[Title/Abstract]OR feeding[Title/Abstract]OR sexual[Title/Abstract]OR disruptive[Title/Abstract]OR cannabis[Title/Abstract]OR eating disorder*[Title/Abstract]OR binge-eating[Title/Abstract]OR anorexia[Title/Abstract]OR bulimia[Title/Abstract]OR bulimi*[Title/Abstract]OR positive psychology[Title/Abstract]OR quality of life[Title/Abstract]OR happiness[Title/Abstract]OR personal satisfaction[Title/Abstract]OR social support[Title/Abstract]OR love[Title/Abstract]OR pleasure[Title/Abstract]OR gratitude[Title/Abstract]OR

compassion[Title/Abstract]OR satisfaction [Title/Abstract]OR life
satisfaction[Title/Abstract]OR well-being[Title/Abstract])

AND

(evaluation[Title/Abstract]OR clinical trial[Title/Abstract]OR trial[Title/Abstract]OR
randomised control[Title/Abstract]OR randomised controlled[Title/Abstract]OR randomized
control[Title/Abstract]OR randomized controlled[Title/Abstract]OR controlled clinical
trial[Title/Abstract]OR rando* control*[Title/Abstract]OR controlled[Title/Abstract] OR
RCTs[Title/Abstract]OR control protocol[Title/Abstract]OR study protocol[Title/Abstract]OR
pilot[Title/Abstract]OR clinical protocol[Title/Abstract]OR RCT[Title/Abstract]OR
RCTs[Title/Abstract]OR feasibility[Title/Abstract]OR fesability trial)

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