

## Supplemental Online Content

Bae H, Shin H, Ji H, Kwon JS, Kim H, Hur J. App-based interventions for moderate to severe depression: a systematic review and meta-analysis. *JAMA Netw Open*. 2023;6(11):e2344120. doi:10.1001/jamanetworkopen.2023.44120

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This supplemental material has been provided by the authors to give readers additional information about their work.

**eTable 1. Egger Regression Test for the Assessment of Publication Bias**

<b>SMD</b>	<b>Coefficient</b>	<b><i>SE</i></b>	<b><i>t</i></b>	<b><i>P</i></b>	<b>95% CI</b>	
Slope	0.469	0.216	2.17	.05	0.006	0.933
Bias	0.175	1.005	0.17	.87	−1.981	2.330

eTable 2. Results of Exploratory Post Hoc Meta-Regression Analyses

Continuous variables	Number of apps	Sample size (intervention /control)	$\beta$	95% CI		SE	P
Mean age	14	736/674	-0.001	-0.032	0.030	0.014	.96
Publication year	16	756/684	-0.032	-0.198	0.134	0.077	.69
Dropout rate	16	756/684	-0.009	-0.021	0.003	0.006	.14

## eMethods 1. Keywords Used in Search of Studies

→ For PubMed:

('depression'[Title/Abstract] OR 'depressive symptoms'[Title/Abstract] OR 'depressive disorder'[Title/Abstract]) AND ('mobile application'[Title/Abstract] OR 'smartphone application'[Title/Abstract] OR mobile[Title/Abstract] OR smartphone[Title/Abstract] OR iphone[Title/Abstract] OR android[Title/Abstract] OR app[Title/Abstract]) AND ('randomized controlled trial'[Title/Abstract] OR randomized[Title/Abstract] OR randomised[Title/Abstract])

→ For Embase:

('depression':ab,ti OR 'depressive symptoms':ab,ti OR 'depressive disorder':ab,ti) AND ('mobile application':ti,ab OR 'smartphone application':ti,ab OR mobile:ti,ab OR smartphone:ti,ab OR iphone:ti,ab OR android:ti,ab OR app:ti,ab) AND ('randomized controlled trial':ti,ab OR randomized:ti,ab OR randomised:ti,ab)

→ For PsycINFO:

(TI depression OR AB depression OR TI “depressive symptoms” OR AB “depressive symptoms” OR TI “depressive disorder” OR AB “depressive disorder”) AND (TI “mobile applications” OR AB “mobile applications” OR TI “smartphone applications” OR AB “smartphone applications” OR TI “mobile app” OR AB “mobile app” OR TI “smartphone app” OR AB “smartphone app” OR TI mobile OR AB mobile OR TI smartphone OR AB smartphone OR TI iPhone OR AB iPhone OR TI Android OR AB Android OR TI app OR AB app) AND (TI “randomized controlled trial” OR AB “randomized controlled trial” OR TI randomized OR AB randomized OR TI randomised or AB randomised)

## **eMethods 2. Inclusion and Exclusion Criteria**

### *Inclusion criteria*

**Participants:** Adults aged 18 years or older with the symptoms of unipolar depression, determined by formal diagnosis or achieving a minimum cut-off score for moderate severity on a validated depression rating scale. There were no restrictions on sex, ethnicity, and nationality.

**Intervention:** Any therapeutic interventions aiming at ameliorating mental health and well-being delivered via mobile applications on smartphones and/or tablets. No restrictions were placed on the therapeutic orientation employed by the intervention, such as cognitive behavioral therapy (CBT), behavioral activation (BA), positive psychology, or any combination thereof.

**Comparator:** Control groups could be either inactive (e.g., waitlist control) or active (e.g., treatment-as-usual, attentional control).

**Outcomes:** Changes in depressive symptoms as measured by the standardized patient- or clinician-rated depression-assessing instruments.

**Study Design:** Only randomized clinical trials (RCTs) published in English were included.

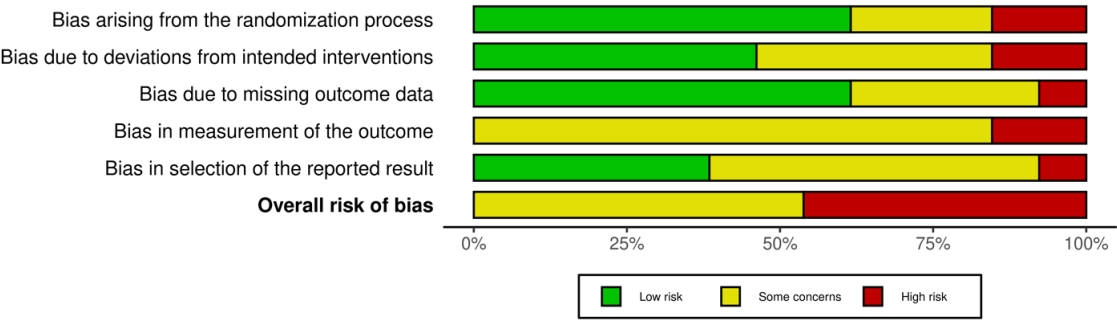
### *Exclusion criteria*

Exclusion criteria were as follows: (1) were non-randomized studies, dissertations, conference articles, or grey literature, (2) did not have relevant populations (i.e., participants under 18 years of age, with mild or no depressive symptoms, or with bipolar depression and/or postpartum depression<sup>2,3</sup>), (3) did not use mobile application interventions (i.e., web-based eHealth, text-messages or e-mail intervention, or VR exposure therapy), (4) did not report the outcomes of interest (i.e., depressive symptoms), (5) did not report original data (i.e., reviews, meta-analyses, secondary sources, or study protocols), (6) were duplicate articles, and (7) were not published in English.

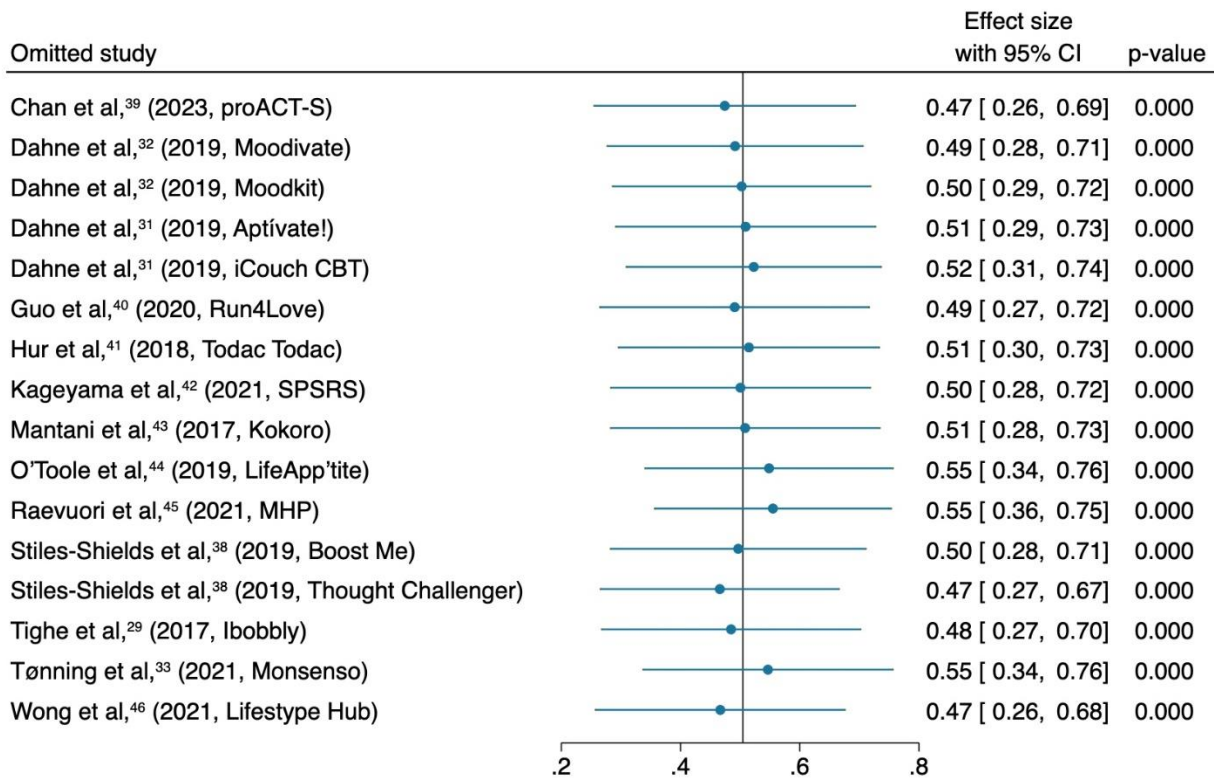
**eFigure 1. Traffic Light Plot for Risk of Bias of Each Included Study<sup>4</sup>**

		Risk of bias domains					
		D1	D2	D3	D4	D5	Overall
Study	Chan et al. (2023)						
	Dahne et al. (2019a)						
	Dahne et al. (2019b)						
	Guo et al. (2020)						
	Hur et al. (2018)						
	Kageyama et al. (2021)						
	Mantani et al. (2017)						
	O'Toole et al. (2019)						
	Raevuori et al. (2021)						
	Stiles-Shields et al. (2019)						
	Tighe et al. (2017)						
	Tønning et al. (2021)						
	Wong et al. (2021)						
Domains:		Judgement					
D1: Bias arising from the randomization process.		High					
D2: Bias due to deviations from intended intervention.		Some concerns					
D3: Bias due to missing outcome data.		Low					
D4: Bias in measurement of the outcome.							
D5: Bias in selection of the reported result.							

**eFigure 2. The Overall Risk of Bias Summary of the Included Studies<sup>4</sup>**



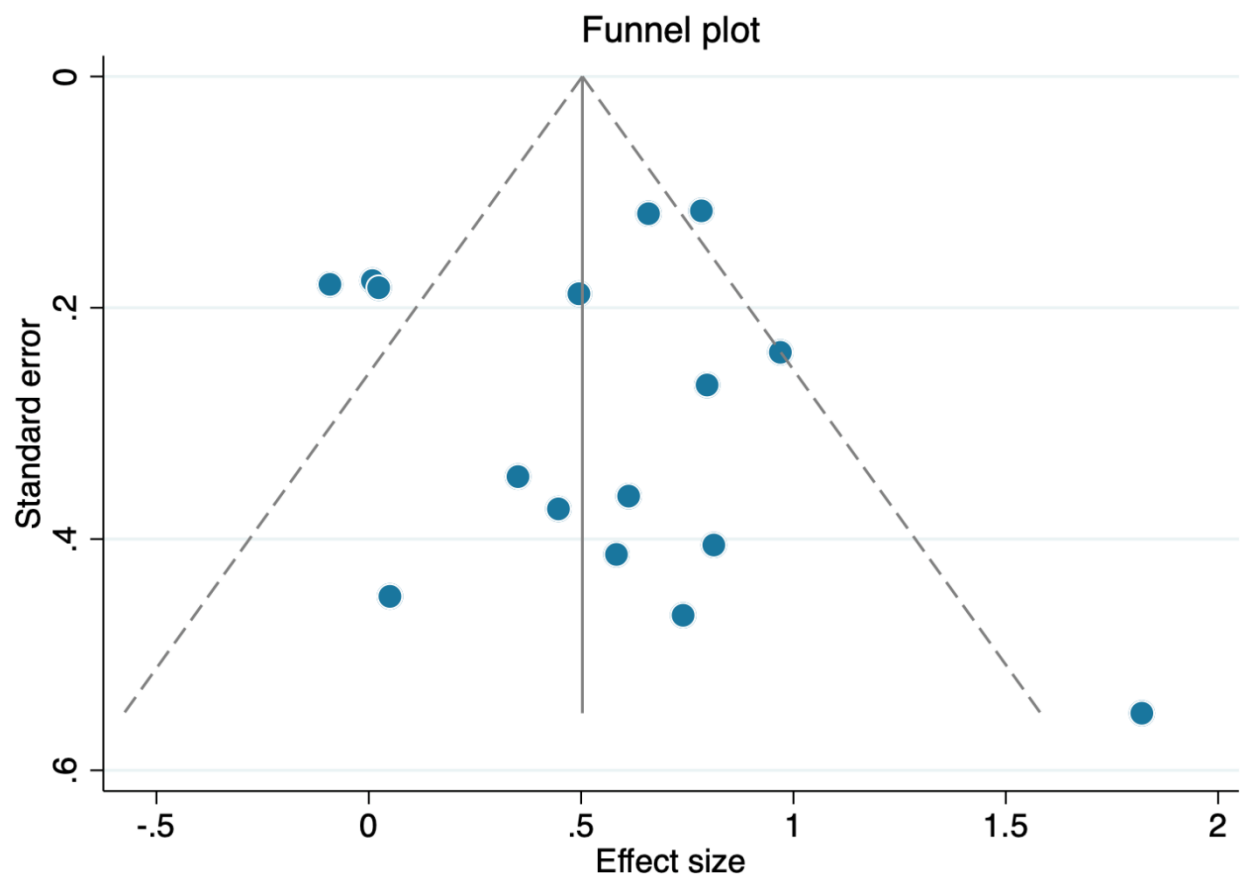
**eFigure 3. Sensitivity Analysis by the Leave-One-Out Method**



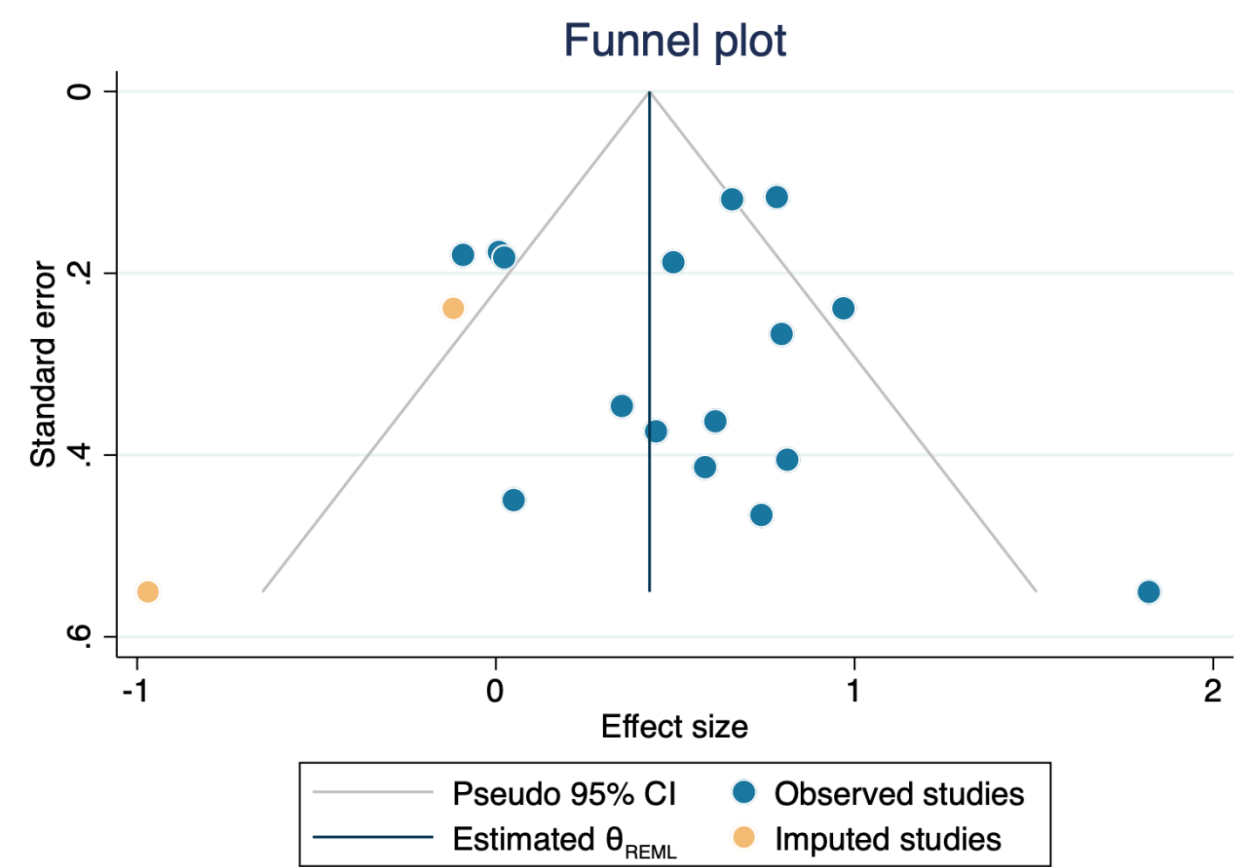
Random-effects REML model



**eFigure 4. Funnel Plot Assessing Publication Bias for the Efficacy of Mobile App Intervention for Depression**



eFigure 5. Duval and Tweedie Trim-and-Fill Funnel Plot



## References

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