

Supplementary Information to:

Personalised & Optimised Therapy (POT) algorithm using five cognitive and behavioural skills for subthreshold depression

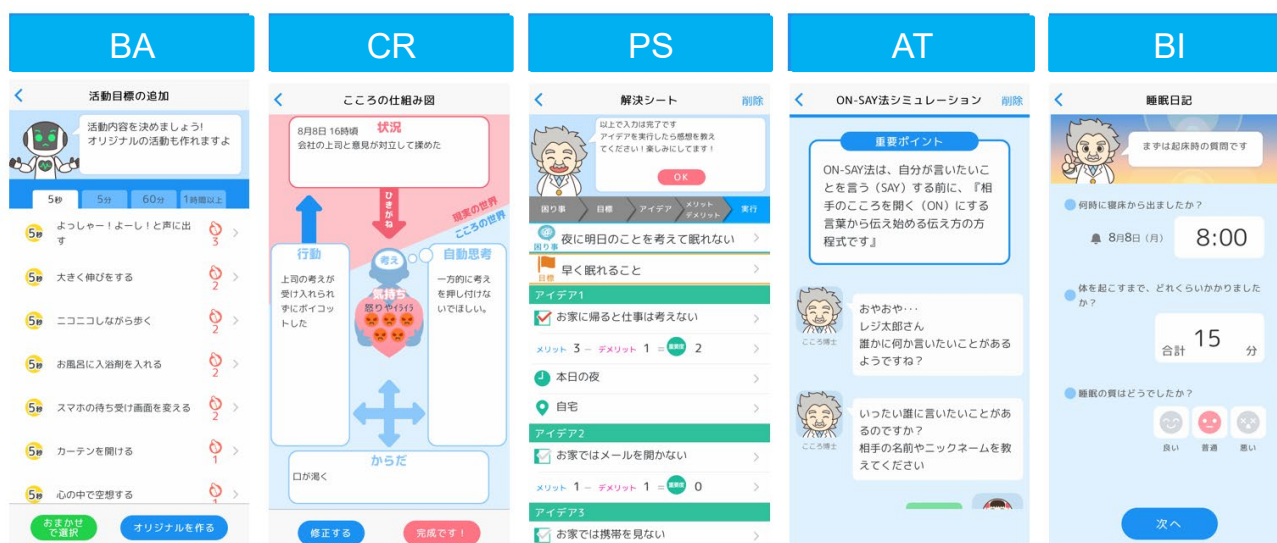
Supplementary Figure 1. Contents of the interventions and control

1a. Proceedings of the intervention and control arms

		Introduction	Chapter 1	Chapter 2	Chapter 3	Chapter 4	Chapter 5	Epilogue
1	BA	3 lessons for psychoeducation	4 basic lessons for BA	2 advanced lessons for BA	1 advanced lesson for BA	1 advanced lesson for BA	BA in everyday life	Epilogue
2	CR	3 lessons for psychoeducation	4 basic lessons for CR	2 advanced lessons for CR	1 advanced lesson for CR	1 advanced lesson for CR	CR in everyday life	Epilogue
3	PS	3 lessons for psychoeducation	4 basic lessons for PS	2 advanced lessons for PS	2 advanced lessons for PS	1 advanced lesson for PS	PS in everyday life	Epilogue
4	AT	3 lessons for psychoeducation	5 basic lessons for AT	2 advanced lessons for AT	1 advanced lesson for AT	1 advanced lesson for AT	AT in everyday life	Epilogue
5	BI	3 lessons for psychoeducation	5 basic lessons for BI	1 advanced lesson for BI	1 advanced lesson for BI	1 advanced lesson for BI	BI in everyday life	Epilogue
6	BA+CR	3 lessons for psychoeducation	4 basic lessons for BA	4 advanced lessons for BA	4 basic lessons for CR	4 advanced lessons for CR	BA&CR in everyday life	Epilogue
7	BA+PS	3 lessons for psychoeducation	4 basic lessons for BA	4 advanced lessons for BA	4 basic lessons for PS	5 advanced lessons for PS	BA&PS in everyday life	Epilogue
8	BA+AT	3 lessons for psychoeducation	4 basic lessons for BA	4 advanced lessons for BA	5 basic lessons for AT	4 advanced lessons for AT	BA&AT in everyday life	Epilogue
9	BA+BI	3 lessons for psychoeducation	4 basic lessons for BA	4 advanced lessons for BA	5 basic lessons for BI	3 advanced lessons for BI	BA&BI in everyday life	Epilogue
10	Health information	1 lesson for psychoeducation	Physical exercise	Nutrition	Oral health	-	-	Epilogue

BA: behavioural activation, CR: cognitive restructuring, PS: problem solving, AT: assertion training, BI: behaviour therapy for insomnia

1b. Screenshots of the five skills of the Resilience Training App Version 2.1.



Supplementary Table 1. Group average PHQ-9 change scores from baseline to week 26 among participants with baseline PHQ9 ≤4

Arm	N	N (26W)	Estimated least squares mean change scores of the PHQ-9 at Week 26 [†] (95% CI)	Effect size for Baseline-Week 26 change scores [‡] (95% CI)	Estimated differences of change scores (95% CI)	<i>P</i> -value	Effect size for differences of change scores [‡] (95% CI)
BA	118	112	-0.30 (-0.99 to 0.38)	-0.27 (-0.88 to 0.34)	-0.57 (-1.19 to 0.06)	0.077	-0.23 (-0.48 to 0.03)
CR	119	108	-0.09 (-0.78 to 0.60)	-0.08 (-0.69 to 0.53)	-0.35 (-0.98 to 0.28)	0.276	-0.14 (-0.40 to 0.11)
PS	119	106	0.09 (-0.6 to 0.79)	0.08 (-0.53 to 0.70)	-0.17 (-0.8 to 0.47)	0.605	-0.07 (-0.32 to 0.19)
AT	118	111	-0.32 (-1.00 to 0.37)	-0.28 (-0.89 to 0.33)	-0.58 (-1.21 to 0.05)	0.071	-0.23 (-0.49 to 0.02)
BI	120	108	-0.37 (-1.06 to 0.31)	-0.33 (-0.95 to 0.28)	-0.64 (-1.27 to -0.01)	0.048	-0.26 (-0.51 to 0.00)
BA + CR	118	110	-0.37 (-1.05 to 0.32)	-0.33 (-0.94 to 0.29)	-0.63 (-1.26 to 0.00)	0.051	-0.25 (-0.51 to 0.00)
BA + PS	120	102	0.18 (-0.51 to 0.87)	0.16 (-0.46 to 0.78)	-0.08 (-0.72 to 0.55)	0.801	-0.03 (-0.29 to 0.23)
BA + AT	119	105	-0.24 (-0.94 to 0.45)	-0.22 (-0.83 to 0.40)	-0.51 (-1.14 to 0.13)	0.118	-0.21 (-0.46 to 0.05)
BA + BI	119	107	-0.04 (-0.73 to 0.65)	-0.03 (-0.65 to 0.58)	-0.30 (-0.93 to 0.33)	0.354	-0.12 (-0.38 to 0.14)
Health information [reference]	119	116	0.26 (-0.38 to 0.91)	0.23 (-0.34 to 0.81)	—	—	—

AT: assertion training, BA: behavioural activation, BI: behaviour therapy for insomnia, CR: cognitive restructuring, PHQ-9: Patient Health Questionnaire-9, PS: problem solving,

[†]Minus value indicates depression reduction. () indicates 95% confidence intervals.

[‡]Effect sizes (standardised mean differences) were calculated using the observed baseline SD for within-group change score and the observed week 26 SD for group differences. The Delayed treatment group engaged in the program during after week 6, and is therefore excluded from the week 26 analyses.

Supplementary Table 2. Group average PHQ-9 change scores from baseline to week 26 among participants with baseline PHQ9 ≥ 5

Arm	N		Estimated least squares mean change scores of the PHQ-9 at Week 26 [†] (95% CI)	Effect size for Baseline-Week 26 change scores [‡] (95% CI)	Estimated differences of change scores (95% CI)		Effect size for differences of change scores [‡] (95% CI)
	N	N (26W)				P-value	
BA	327	302	-2.89 (-3.48 to -2.30)	-1.05 (-1.27 to -0.84)	-0.67 (-1.26 to -0.08)	0.026	-0.17 (-0.31 to -0.02)
CR	328	297	-2.86 (-3.46 to -2.26)	-1.04 (-1.26 to -0.83)	-0.64 (-1.23 to -0.05)	0.034	-0.16 (-0.31 to -0.01)
PS	328	289	-2.70 (-3.30 to -2.10)	-0.99 (-1.21 to -0.77)	-0.49 (-1.08 to 0.11)	0.111	-0.12 (-0.27 to 0.03)
AT	328	297	-2.75 (-3.35 to -2.15)	-1.00 (-1.22 to -0.78)	-0.53 (-1.12 to 0.07)	0.081	-0.13 (-0.28 to 0.02)
BI	328	291	-3.11 (-3.71 to -2.52)	-1.14 (-1.35 to -0.92)	-0.90 (-1.49 to -0.30)	0.003	-0.22 (-0.37 to -0.07)
BA + CR	329	290	-3.31 (-3.91 to -2.71)	-1.21 (-1.43 to -0.99)	-1.09 (-1.69 to -0.50)	< 0.001	-0.27 (-0.42 to -0.12)
BA + PS	329	293	-3.28 (-3.87 to -2.68)	-1.20 (-1.41 to -0.98)	-1.06 (-1.65 to -0.47)	< 0.001	-0.26 (-0.41 to -0.12)
BA + AT	328	281	-3.14 (-3.74 to -2.53)	-1.14 (-1.36 to -0.92)	-0.92 (-1.52 to -0.32)	0.003	-0.23 (-0.38 to -0.08)
BA + BI	327	286	-2.87 (-3.47 to -2.27)	-1.05 (-1.27 to -0.83)	-0.65 (-1.25 to -0.06)	0.032	-0.16 (-0.31 to -0.01)
Health information [reference]	328	315	-2.22 (-2.81 to -1.63)	-0.81 (-1.02 to -0.59)	—	—	—

AT: assertion training, BA: behavioural activation, BI: behaviour therapy for insomnia, CR: cognitive restructuring, PHQ-9: Patient Health Questionnaire-9, PS: problem solving,

[†]Minus value indicates depression reduction. () indicates 95% confidence intervals.

[‡]Effect sizes (standardised mean differences) were calculated using the observed baseline SD for within-group change score and the observed week 26 SD for group differences. The Delayed treatment group engaged in the program during after week 6, and is therefore excluded from the week 26 analyses.

Supplementary Table 3. Regression coefficient estimates by LASSO regularized estimation (Model 1)

N.B. Because the dependent variable is the change in PHQ-9 scores from baseline, negative coefficients for PF mean that the presence (or the higher score) of the variable predicts greater reduction in the PHQ-9. Negative coefficients for EM mean that the presence (or the higher score) of the variables predicts that the intervention produces greater reduction in the PHQ-9 when the variable is present (or shows higher scores).

	PF	EM								
		BA	CR	PS	AT	BI	BA+CR	BA+PS	BA+AT	BA+BI
BA	-	-	-	-	-	-	-	-	-	-
CR	-	-	-	-	-	-	-	-	-	-
PS	-	-	-	-	-	-	-	-	-	-
AT	-	-	-	-	-	-	-	-	-	-
BI	-	-	-	-	-	-	-	-	-	-
BA+CR	-	-	-	-	-	-	-	-	-	-
BA+PS	-	-	-	-	-	-	-	-	-	-
BA+AT	-	-	-	-	-	-	-	-	-	-
BA+BI	-	-	-	-	-	-	-	-	-	-
Age	-0.008	-	-	-	-	-	-	-	-	-
Sex (male/female/other)	-0.011	-	-	-	-	-	-	-	-	-
Relationship status (yes/no)	-	-0.120	-0.002	0.001	-	-0.007	-0.023	-	-0.017	-
No of cohabitants including self	-0.049	-	-	-	-	-	-	-	-0.001	-
Education (years)	-	-	-	-	-	-	-	-	-	-
Employed (yes/no)	0.636	-	-	-	-	-	-	-	-	-
Big 5 personality traits (Score range: 1-5)										
Neuroticism	0.050	-	-	-	-	-	-	-	-	-
Extraversion	-0.037	-	-	-	-	-0.002	-	-	-0.005	-0.006
Openness	-0.011	-	-	-	-	-	-0.047	-	-	-
Conscientiousness	-0.004	-	-	-	-	-	-	-	-	-0.003
Agreeableness	-0.036	-	-	-	-	-	-	-	-0.001	-
Adverse Childhood Experiences (Score range: 0-10)	0.001	-0.002	-	-	0.002	-	-	-	-0.005	-
Assessment of Signal Cases (Score range:0-3)										
Life difficulties	0.216	-	-	-	0.002	-0.002	-	-0.046	-0.019	0.001
Social support	-0.186	-	-0.001	-0.003	-0.005	-0.008	-	-	-	-
Motivation	-0.210	-	-	-	-	-	-	-	-	-
CBT skills (Score range: 0-3)										
BA skills	-	-	-	-	-	-0.042	-	-	-	-
CR skills	-	-	-	-	-	-0.013	-	0.001	-0.001	-
PS skills	0.035	-	-	-	-	-	-	-	-	-
AT skills	0.018	-	-	-	-	-	-	-	-	-
BI skills	-0.007	-	-	-	-	-0.002	-0.005	-	-	-
Familiarity with smartphone (Score range: 0-3)	-	-	-	-	-0.005	-0.050	-0.008	-	-	-
Hypertension	-0.001	-0.087	0.004	0.001	0.001	-0.150	-0.003	-0.002	0.002	-0.288
Diabetes	-	-0.087	-0.151	1.058	0.028	-	0.046	-	0.144	-0.383
Chronic pain	0.255	0.091	-0.001	0.005	-	-	0.029	-0.012	-0.001	-
Any physical disease	0.002	-	-	0.001	-	-	-	-0.019	0.009	-0.001
Physical disabilities	0.003	-	0.019	-	-	-0.003	0.002	-0.021	0.062	-
Exercise habits	-0.121	-	-0.036	-	-0.007	-	-	-	-	-0.002
Past or current treatments for mental health	0.270	-	-	0.056	-	0.014	-	-0.030	-0.003	-
CAGE questionnaire score	0.035	-	-0.004	-0.069	0.054	-0.003	0.008	0.185	-0.016	0.212
PHQ-9 score	-0.493	-0.003	-	-	0.001	-0.008	-0.030	-0.064	-	-
GAD-7 score	-	-	-	-	-	-	-	-	-0.022	-
ISI score	0.005	-	-	-	-	-	-	-	-	-
WSAS score	0.080	-	-	-	-	-	-0.001	-	-	-
EQ-5D-5L score	-1.077	-	-	-	-	-	-	-	-	-

SWEMWBS score	-0.051	-	-	-	-	-	-	-	-
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AT: assertion training, BA: behavioural activation, BI: behaviour therapy for insomnia, CR: cognitive restructuring, EM: effect modifier (interaction term with each treatment), EQ-5D: EuroQOL-5D-5L, GAD-7: General Anxiety Disorder-7, ISI: Insomnia Severity Index PF: prognostic factor, PHQ-9: Patient Health Questionnaire-9, PS: problem solving, SWEMWBS: Short Warwick Edinburgh Mental Well-Being Scale, WSAS: Work and Social Adjustment Scale

N.B. Because the dependent variable is the change in PHQ-9 scores from baseline, negative coefficients for PF mean that the presence (or the higher score) of the variable predicts greater reduction in the PHQ-9. Negative coefficients for EM mean that the presence (or the higher score) of the variables predicts that the intervention produces greater reduction in the PHQ-9 when the variable is present (or shows higher scores).

Supplementary Table 4. Regression coefficient estimates by LASSO regularized estimation (Model 2)

	PF	EM								
		BA	CR	PS	AT	BI	BA+CR	BA+PS	BA+AT	BA+BI
BA	-	-	-	-	-	-	-	-	-	-
CR	-	-	-	-	-	-	-	-	-	-
PS	-	-	-	-	-	-	-	-	-	-
AT	-	-	-	-	-	-	-	-	-	-
BI	-	-	-	-	-	-	-	-	-	-
BA+CR	-	-	-	-	-	-	-	-	-	-
BA+PS	-	-	-	-	-	-	-	-	-	-
BA+AT	-	-	-	-	-	-	-	-	-	-
BA+BI	-	-	-	-	-	-	-	-	-	-
Age	-0.006	-	-	-	-	-	-	-	-	-
Sex (male/female/other)	-0.008	-	-	-	-0.004	-	-	-	-	-
Relationship status (yes/no)	-	-0.039	-	-	-	-0.005	-0.001	-	-0.017	-
No of cohabitants including self	-0.030	-	-	-	-	-	-	-	-	-
Education (years)	-	-	-	-	-	-	-	-	-	-
Employed (yes/no)	0.523	-	-	-	-	-	-	-	-	-
Big 5 personality traits (Score range: 1-5)										
Neuroticism	0.038	-	-	-	-	-	-	-	-	-
Extraversion	-0.049	-	-	-	-	-0.002	-	-	-	-
Openness	-0.021	-	-	-	-	-	-0.010	-	-	-
Conscientiousness	-	-	-	-	-	-	-	-	-	-
Agreeableness	-0.006	-	-	-	-0.003	-	-	-	-	-
Adverse Childhood Experiences (number)	-	-0.001	-	-	-	-	-	-	-0.008	-
Assessment of Signal Cases (Score range:0-3)										
Life difficulties	0.012	-	-	-	-	-0.001	-	-0.002	-0.012	-
Social support	-0.115	-	-	-0.002	-0.003	-0.002	-	-	-	-
Motivation	-0.074	-	-	-	-	-	-	-	-	-
CBT skills (Score range: 0-3)										
BA skills	-	-	-	-	-	-0.017	-	0.001	-	-
CR skills	-	-	-	-	-	-0.015	-	0.002	-	-
PS skills	0.004	-	-	-	-	-	-	-	-	-
AT skills	0.008	-	-	-	-	-	-	0.001	-	-0.001
BI skills	-0.003	-	-	-	-	-	-	-	-	-
Familiarity with smartphone (Score range: 0-3)	-	-	-	-	-0.013	-0.008	-0.009	-	-	-
Hypertension	-0.001	-0.065	0.003	0.005	0.002	-0.068	-0.001	-0.003	-	-0.112
Diabetes	0.008	-0.022	-0.083	0.956	0.026	-	0.042	-	0.016	-0.097
Chronic pain	0.157	0.195	-	-	-	0.001	0.156	-	-	-
Any physical disease	0.001	-	-	-	-	-	0.002	-0.006	0.017	-0.016
Physical disabilities	0.006	-	0.020	-	-	0.006	0.004	-0.010	0.038	-
Exercise habits	-0.106	-	-0.008	-0.001	-0.007	-	-	-	0.001	-0.007
Past or current treatments for mental health	0.188	-	-	0.002	-	0.017	0.001	-	-0.014	-
CAGE questionnaire score	0.047	0.001	-	-0.078	0.018	-	0.007	0.131	-0.018	0.160
PHQ-9 score	-0.727	-	-	-	-	-	-0.003	-0.004	-	-
GAD-7 score	-0.001	-	-	-0.002	-	-	-	-	-0.012	-
ISI score	-	-	-	-	-	-	-	-	-	-0.001
WSAS score	0.052	-	-	-0.006	-	-	-	-	-	0.001
EQ-5D-5L score	-0.034	-	-	-	-	-	-	-	-	-
SWEMWBS score	-0.017	-	-	-	-	-	-	-	-	-
PHQ-9 at week 1	0.106	-	-	-	0.028	-	-0.027	-0.004	-	0.001
PHQ-9 at week 2	0.339	-	-	0.027	0.001	-	-0.007	-0.076	-	-

AT: assertion training, BA: behavioural activation, BI: behaviour therapy for insomnia, CR: cognitive restructuring, EM: effect modifier (interaction term with each treatment), EQ-5D: EuroQOL-5D-5L, GAD-7: General Anxiety Disorder-7, ISI: Insomnia

Severity Index PF: prognostic factor, PHQ-9: Patient Health Questionnaire-9, PS: problem solving, SWEMWBS: Short Warwick Edinburgh Mental Well-Being Scale, WSAS: Work and Social Adjustment Scale

N.B. Because the dependent variable is the change in PHQ-9 scores from baseline, negative coefficients for PF mean that the presence (or the higher score) of the variable predicts greater reduction in the PHQ-9. Negative coefficients for EM mean that the presence (or the higher score) of the variables predicts that the intervention produces greater reduction in the PHQ-9 when the variable is present (or shows higher scores).

Supplementary Table 5. Regression coefficient estimates by LASSO regularized estimation (Model 3)

	PF	EM								
		BA	CR	PS	AT	BI	BA+CR	BA+PS	BA+AT	BA+BI
BA	-	-	-	-	-	-	-	-	-	-
CR	-	-	-	-	-	-	-	-	-	-
PS	-	-	-	-	-	-	-	-	-	-
AT	-	-	-	-	-	-	-	-	-	-
BI	-	-	-	-	-	-	-	-	-	-
BA+CR	-	-	-	-	-	-	-	-	-	-
BA+PS	-	-	-	-	-	-	-	-	-	-
BA+AT	-	-	-	-	-	-	-	-	-	-
BA+BI	-	-	-	-	-	-	-	-	-	-
Age	-0.006	-	-	-	-	-	-	-	-	-
Sex (male/female/other)	-0.006	-	-	-	-0.001	-	-	-	-	-
Relationship status (yes/no)	-	-0.007	-	-	-	-0.002	-0.001	0.001	-0.009	-
No of cohabitants including self	-0.029	-	-	-	-	-	-	-	-	-
Education (years)	-	-	-	-	-	-	-	-	-	-
Employed (yes/no)	0.511	-	-	-	-	-	-	-	-	-
Big 5 personality traits (Score range: 1-5)										
Neuroticism	0.036	-	-	-	-	-	-	-	-	-
Extraversion	-0.048	-	-	-	-	-0.001	-	-	-	-
Openness	-0.019	-	-	-	-	-	-0.005	-	-	-
Conscientiousness	-	-	-	-	-	-	-	-	-	-
Agreeableness	-0.005	-	-	-	-0.001	-	-	-	-	-
Adverse Childhood Experiences (number)	-	-	-	-	-	-	-	-	-0.007	-
Assessment of Signal Cases (Score range:0-3)										
Life difficulties	0.008	-	-	-	-	-	-	-	-0.007	-
Social support	-0.115	0.001	-	-	-0.002	-0.001	-	-	-	-
Motivation	-0.063	-	-	-	-	-	-	-	-	-
CBT skills (Score range: 0-3)										
BA skills	-	-	-	-	-	-0.005	-	0.001	-	-
CR skills	-	-	-	-	-	-0.006	-	-	-	-
PS skills	0.003	-	-	-	-	-	-	-	-	-
AT skills	0.006	-	-	-	-	-	-	0.002	-	-
BI skills	-0.002	-	-	-	-	-	-	-	-	-
Familiarity with smartphone (Score range: 0-3)	-	-	-	-	-0.005	-0.002	-0.005	-	-	-
Hypertension	-0.001	-0.041	0.005	0.005	0.002	-0.045	-	-0.001	-	-0.070
Diabetes	0.005	-0.014	-0.056	0.919	0.023	-	0.031	-	0.006	-0.077
Chronic pain	0.147	0.190	-	-	-	0.001	0.118	-	-	-
Any physical disease	-	-	-	-	-	-	0.001	-0.002	0.012	-0.007
Physical disabilities	0.003	-	0.025	-	-	0.003	0.003	-0.005	0.032	-
Exercise habits	-0.103	-	-0.001	-	-0.004	-	-	-	0.001	-0.001
Past or current treatments for mental health	0.180	-	-	0.003	-	0.018	-	-0.001	-0.009	-
CAGE questionnaire score	0.037	0.001	-	-0.055	0.019	-	0.005	0.121	-0.011	0.177
PHQ-9 score	-0.723	-	-	-	-	-	-0.003	-0.003	-	-
GAD-7 score	-	-	-	-0.001	-	-	-	-	-0.007	-
ISI score	-	-	-	-	-	-	-	-	-	-
WSAS score	0.049	-	-	-0.003	-	-	-	-	-	0.001
EQ-5D-5L score	-0.027	-	-	-	-	-	-	-	-	-
SWEMWBS score	-0.017	-	-	-	-	-	-	-	-	-
PHQ-9 at week 1	0.104	-	-	-	0.029	-	-0.023	-0.003	-	0.002
PHQ-9 at week 2	0.334	-	-	0.030	0.001	-	-0.006	-0.066	-	-
Missing indicator of PHQ-9 at w1	0.105	-0.038	0.037	0.003	0.020	-0.160	0.377	-0.031	-0.004	-0.313
Missing indicator of PHQ-9 at w2	0.117	0.005	-0.091	0.008	0.032	0.014	-0.161	0.157	0.014	0.024

AT: assertion training, BA: behavioural activation, BI: behaviour therapy for insomnia, CR: cognitive restructuring, EM: effect modifier (interaction term with each treatment), EQ-5D: EuroQOL-5D-5L, GAD-7: General Anxiety Disorder-7, ISI: Insomnia Severity Index PF: prognostic factor, PHQ-9: Patient Health Questionnaire-9, PS: problem solving, SWEMWBS: Short Warwick Edinburgh Mental Well-Being Scale, WSAS: Work and Social Adjustment Scale

N.B. Because the dependent variable is the change in PHQ-9 scores from baseline, negative coefficients for PF mean that the presence (or the higher score) of the variable predicts greater reduction in the PHQ-9. Negative coefficients for EM mean that the presence (or the higher score) of the variables predicts that the intervention produces greater reduction in the PHQ-9 when the variable is present (or shows higher scores).

Supplementary Table 6. Recommended treatments according to PrBest by stratum

	BA	CR	PS	AT	BI	BA+CR	BA+PS	BA+AT	BA+BI	HI
According to Model 1										
Baseline PHQ-9 $\leq$ 4	53	48	90	199	206	261	43	127	162	0
Baseline PHQ-9 $\geq$ 5	173	81	146	34	401	869	941	410	225	0
According to Model 1 for those with baseline PHQ-9 $\leq$4, and Model 2 for those with baseline PHQ-9 $\geq$5										
Baseline PHQ-9 $\leq$ 4	53	48	90	199	206	261	43	127	162	0
Baseline PHQ-9 $\geq$ 5	0	0	0	0	0	1009	1089	792	390	0
According to Model 1 for those with baseline PHQ-9 $\leq$4, and Model 3 for those with baseline PHQ-9 $\geq$5										
Baseline PHQ-9 $\leq$ 4	53	48	90	199	206	261	43	127	162	0
Baseline PHQ-9 $\geq$ 5	0	0	0	0	0	962	1044	742	532	0

AT: assertion training, BA: behavioural activation, BI: behaviour therapy for insomnia, CR: cognitive restructuring, HI: health information, PHQ-9: Patient Health Questionnaire-9, PS: problem solving,

Supplementary Table 7. Improvement over the average group best (BA+CR vs HI) in simulated RCTs of the various POT algorithms for people with baseline PHQ-9 ≤ 4

	Any of the nine interventions	Top 3 interventions (AT, BI, BA+CR)	Only single-skill interventions of the top 3 (AT, BI)	Only the best single-skill intervention (BI)
Using Model 1	-47.4%	7.2%	36.1%	15.1%

AT: assertion training, BA: behavioural activation, BI: behaviour therapy for insomnia, CR: cognitive restructuring, HI: health information, PHQ-9: Patient Health Questionnaire-9, PS: problem solving,

Supplementary Table 8. Improvement over the average group best (BA+CR vs HI) in simulated RCTs of the various POT algorithms for people with baseline PHQ-9 ≥ 5

5b1. Using Model 1

	Any of the nine interventions	Any of the two-skill interventions (BA+CR, BA+PS, BA+AT, BA+BI)	Top 3 two-skill interventions (BA+CR, BA+PS, BA+AT)	Top 2 two-skill interventions (BA+CR, BA+PS)	Only the best two-skill interventions (BA+PS)
Using Model 1	-9.5%	13.1%	13.4%	12.1%	-11.6%
Using Model 2	(Inappropriate because one-skill interventions have to be chosen at baseline)	16.2%	21.1%	8.5%	-11.6%
Using Model 3	(Inappropriate because one-skill interventions have to be chosen at baseline)	18.1%	25.6%	8.4%	-11.6%

AT: assertion training, BA: behavioural activation, BI: behaviour therapy for insomnia, CR: cognitive restructuring, HI: health information, PHQ-9: Patient Health Questionnaire-9, PS: problem solving,

Supplementary Table 9. Comparison of predictive accuracy measures for various machine learning methods for Model 1 by 10-fold cross-validation in the completers' dataset

	N	R ²	R	Bias	MAE [†]	RMSE [‡]	Calibration -in-the- large	Calibration slope
Regularised regression models								
RIDGE regression	3963	0.176	0.419	0.006	2.507	3.467	0.046	1.017
LASSO regression	3963	0.206	0.454	0.003	2.450	3.403	0.097	1.042
Elastic-net regression	3963	0.205	0.452	0.002	2.452	3.406	0.109	1.047
Support vector machine	3963	0.145	0.381	0.384	2.541	3.555	0.107	0.896
Causal forest*	3963	0.007	0.085	0.000	2.791	3.805	-0.013	0.994

[†]Mean absolute error.

[‡]Root mean squared error.

*The predictive values were calculated as calibrated individual treatment effect estimates that the bias was to be 0.

CONSORT-AI checklist of information to include when reporting a randomised trials of AI interventions

Section	Item	CONSORT 2010 Item ^a	CONSORT-AI Item		Addressed on Page No ^b
Title and Abstract					
Title and Abstract	1a	Identification as a randomised trial in the title	CONSORT-AI 1a,b Elaboration	(i) Indicate that the intervention involves artificial intelligence/machine learning in the title and/or abstract and specify the type of model.	3
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)		(ii) State the intended use of the AI intervention within the trial in the title and/or abstract.	3
Introduction					
Background and objectives	2a	Scientific background and explanation of rationale	CONSORT-AI 2a (i) Extension	Explain the intended use of the AI intervention in the context of the clinical pathway, including its purpose and its intended users (e.g. healthcare professionals, patients, public).	5
	2b	Specific objectives or hypotheses			5
Methods					
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio			14
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons			
Participants	4a	Eligibility criteria for participants	CONSORT-AI 4a (i) Elaboration	State the inclusion and exclusion criteria at the level of participants.	14, Supplement
			CONSORT-AI 4a (ii) Extension	State the inclusion and exclusion criteria at the level of the input data.	15-16, Supplement
	4b	Settings and locations where the data were collected	CONSORT-AI 4b Extension	Describe how the AI intervention was integrated into the trial setting, including any onsite or offsite requirements.	16-19
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	CONSORT-AI 5 (i) Extension	State which version of the AI algorithm was used.	19
			CONSORT-AI 5 (ii) Extension	Describe how the input data were acquired and selected for the AI intervention.	17
			CONSORT-AI 5 (iii) Extension	Describe how poor quality or unavailable input data were assessed and handled.	17
			CONSORT-AI 5 (iv) Extension.	Specify whether there was human-AI interaction in the handling of the input data, and what level of expertise was required of users.	17-18
			CONSORT-AI 5 (v) Extension	Specify the output of the AI intervention	17-18
			CONSORT-AI 5 (vi) Extension	Explain how the AI intervention's outputs contributed to decision-making or other elements of clinical practice.	18
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed			15
	6b	Any changes to trial outcomes after the trial commenced, with reasons			Not relevant

Cite as:

Sample size	7a	How sample size was determined			Protocol
	7b	When applicable, explanation of any interim analyses and stopping guidelines			Not relevant
Randomisation					
Sequence generation	8a	Method used to generate the random allocation sequence			16
	8b	Type of randomisation; details of any restriction (such as blocking and block size)			16
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned			16
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions			16
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how			16
	11b	If relevant, description of the similarity of interventions			15
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes			18
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses			16-19
Results					
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome			6 (Fig 1)
	13b	For each group, losses and exclusions after randomisation, together with reasons			6 (Fig 1)
Recruitment	14a	Dates defining the periods of recruitment and follow-up			5
	14b	Why the trial ended or was stopped			Not relevant
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group			Table 1
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups			6 (Fig 1)
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)			8
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended			Not relevant
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory			Not relevant
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	CONSORT-AI 19 Extension	Describe results of any analysis of performance errors and how errors were identified, where applicable. If no such analysis was planned or done, explain why not.	9

Cite as:

Discussion					
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses			13-14
Generalisability	21	Generalisability (external validity, applicability) of the trial findings			14
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence			14
Other Information					
Registration	23	Registration number and name of trial registry			14
Protocol	24	Where the full trial protocol can be accessed, if available			14
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	CONSORT-AI 25 Extension.	State whether and how the AI intervention and/or its code can be accessed, including any restrictions to access or re-use.	20, 21

^a We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items.

^b Indicates page numbers to be completed by authors during protocol development.