Supplementary Materials

Testing the Applicability of Idionomic Statistics in Longitudinal Studies: The Example of 'Doing What Matters'

Section 1: Tables

Table S1

Descriptive statistics of the within-person means of the EMA items (averaged across measurements) in the three samples

	Sample 1 (*n*=70)										
	M	*SD*	median	trimmed	mad	min	max	range	skew	kurtosis	*SE*
Valued Action - Matters	3.15	0.60	3.15	3.13	0.63	1.86	4.71	2.85	0.31	0.03	0.07
Valued Action - Content	3.18	0.63	3.28	3.19	0.6	1.73	4.95	3.23	-0.02	-0.04	0.08
Valued Action - Person	3.46	0.72	3.49	3.49	0.74	1.86	4.86	3.00	-0.32	-0.53	0.09
Joyful	3.06	0.75	3.15	3.08	0.74	1.29	4.67	3.38	-0.26	-0.50	0.09
Ashamed	1.27	0.34	1.12	1.20	0.19	1.00	2.43	1.43	1.48	1.33	0.04
Sad	1.52	0.57	1.33	1.42	0.41	1.00	3.71	2.71	1.64	2.82	0.07
Angry	1.30	0.44	1.13	1.21	0.19	1.00	3.43	2.43	2.68	8.29	0.05
Stressful Events	2.18	0.65	2.05	2.15	0.62	1.10	3.77	2.68	0.48	-0.34	0.08
Positive Events	3.09	0.57	3.20	3.09	0.58	1.67	4.57	2.90	0.06	-0.11	0.07

	Sample 2 (*n*=187)										
	M	*SD*	median	trimmed	mad	min	max	range	skew	kurtosis	*SE*
Valued Action - Matters	3.20	0.60	3.18	3.20	0.53	1.33	4.75	3.42	-0.04	0.05	0.04
Valued Action - Content	3.26	0.57	3.25	3.26	0.58	1.75	4.70	2.95	-0.06	-0.21	0.04
Valued Action - Person	3.49	0.60	3.45	3.49	0.63	1.63	5.00	3.37	-0.04	-0.14	0.04
Joyful	3.14	0.64	3.11	3.15	0.60	1.16	4.56	3.40	-0.06	-0.08	0.05
Ashamed	1.59	0.55	1.40	1.51	0.46	1.00	3.50	2.5	1.16	0.80	0.04
Sad	1.81	0.62	1.71	1.74	0.56	1.00	4.33	3.33	1.19	1.80	0.05
Angry	1.59	0.51	1.48	1.53	0.51	1.00	3.00	2.00	0.92	0.08	0.04
Stressful Events	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Positive Events	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Sample 3 (*n*=168)										
	M	*SD*	median	trimmed	mad	min	max	range	skew	kurtosis	*SE*
Valued Action - Matters	3.18	0.71	3.21	3.19	0.66	1.00	4.83	3.83	-0.21	0.09	0.05
Valued Action - Content	3.21	0.70	3.26	3.23	0.73	1.00	4.73	3.73	-0.37	-0.01	0.05
Valued Action - Person	3.54	0.78	3.58	3.56	0.80	1.00	5.00	4.00	-0.37	-0.02	0.06

Joyful	3.04	0.79	3.00	3.05	0.82	1.00	4.94	3.94	-0.08	-0.16	0.06
Ashamed	1.33	0.50	1.15	1.22	0.22	1.00	3.67	2.67	2.38	5.89	0.04
Sad	1.61	0.57	1.45	1.53	0.42	1.00	4.00	3.00	1.37	1.76	0.04
Angry	1.35	0.44	1.20	1.27	0.30	1.00	4.00	3.00	2.47	8.75	0.03
Stressful Events	2.39	0.66	2.33	2.36	0.51	1.00	4.36	3.36	0.60	0.65	0.05
Positive Events	3.27	0.69	3.29	3.27	0.75	1.37	5.00	3.63	-0.09	-0.29	0.05

Table S2

Means, standard deviations, and correlations with confidence intervals for the mean scores of EMA items averaged across time

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. VA Matters	3.21	0.65								
2. VA Content	3.24	0.64	.87** [.84, .89]							
3. VA Person	3.51	0.71	.79** [.75, .82]	.83** [.80, .86]						
4. Joyful	3.10	0.74	.64** [.58, .70]	.63** [.56, .68]	.57** [.50, .63]					
5. Sad	1.70	0.61	-.42** [-.49, -.34]	-.43** [-.51, -.35]	-.46** [-.53, -.38]	-.42** [-.50, -.34]				
6. Angry	1.46	0.52	-.34** [-.43, -.26]	-.34** [-.42, -.25]	-.36** [-.44, -.27]	-.32** [-.40, -.23]	.68** [.62, .73]			
7. Ashamed	1.47	0.55	-.25** [-.33, -.16]	-.31** [-.39, -.22]	-.37** [-.45, -.28]	-.20** [-.29, -.11]	.61** [.54, .66]	.66** [.61, .71]		
8. Stressful Events	2.34	0.68	-.13* [-.25, -.00]	-.13 [-.25, .00]	-.14* [-.27, -.02]	-.19** [-.31, -.06]	.32** [.20, .43]	.33** [.21, .44]	.33** [.21, .44]	
9. Positive Events	3.21	0.66	.71** [.64, .77]	.65** [.57, .72]	.62** [.53, .69]	.72** [.65, .78]	-.36** [-.46, -.24]	-.28** [-.39, -.16]	-.09 [-.22, .03]	-.07 [-.19, .06]

Note. VA = Valued Action. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation.

Table S3

Descriptive statistics of the raw within-person correlations of the study variables

	n	*M*	*SD*	median	trimmed	mad	min	max	range	skew	kurtosis	*SE*
matters.content	421	0.63	0.28	0.69	0.67	0.22	-0.95	1.00	1.94	-1.72	4.47	0.01
matters.person	422	0.50	0.32	0.55	0.53	0.27	-0.95	1.00	1.95	-1.31	2.52	0.02
content.person	421	0.57	0.30	0.64	0.60	0.27	-0.99	1.00	1.98	-1.32	2.58	0.01
matters.joyful	421	0.39	0.32	0.43	0.41	0.31	-0.94	0.99	1.94	-0.79	0.91	0.02
content.joyful	420	0.37	0.34	0.40	0.39	0.32	-0.99	0.99	1.97	-0.86	1.09	0.02
person.joyful	421	0.35	0.33	0.37	0.37	0.35	-0.69	1.00	1.68	-0.54	-0.01	0.02
matters.sad	420	-0.23	0.34	-0.25	-0.24	0.35	-0.98	0.97	1.94	0.35	0.25	0.02
content.sad	419	-0.22	0.33	-0.23	-0.23	0.33	-0.97	1.00	1.96	0.35	0.14	0.02
person.sad	420	-0.22	0.34	-0.22	-0.23	0.33	-0.99	0.93	1.93	0.29	0.00	0.02
matters.angry	413	-0.18	0.33	-0.19	-0.19	0.34	-0.98	0.97	1.95	0.31	0.13	0.02
content.angry	412	-0.16	0.31	-0.19	-0.18	0.30	-0.92	0.99	1.92	0.47	0.62	0.02
person.angry	413	-0.18	0.33	-0.18	-0.18	0.34	-0.99	0.93	1.92	0.17	0.11	0.02

matters.ashamed	413	-0.15	0.33	-0.16	-0.15	0.35	-0.97	0.95	1.92	0.09	-0.11	0.02
content.ashamed	412	-0.17	0.34	-0.17	-0.18	0.34	-0.97	0.97	1.94	0.31	0.12	0.02
person.ashamed	413	-0.23	0.34	-0.25	-0.23	0.34	-0.99	0.97	1.97	0.12	-0.20	0.02
matters.stress	237	-0.13	0.35	-0.16	-0.13	0.35	-0.97	0.96	1.93	0.10	-0.02	0.02
content.stress	236	-0.10	0.33	-0.10	-0.09	0.32	-0.96	0.99	1.95	-0.08	0.30	0.02
person.stress	237	-0.13	0.31	-0.14	-0.13	0.31	-0.99	0.94	1.93	0.00	0.15	0.02
matters.pos.events	237	0.41	0.36	0.49	0.45	0.31	-0.95	0.95	1.91	-1.25	1.92	0.02
content.pos.events	236	0.37	0.36	0.44	0.41	0.30	-0.99	0.99	1.98	-1.09	1.36	0.02
person.pos.events	237	0.31	0.33	0.34	0.34	0.34	-0.92	1.00	1.91	-0.86	1.05	0.02

Note. The first column contains labels of the two variables which were correlated. For instance, “matters.content” represents the correlation between the ‘matters’ item of valued action with that of the “content” item. Grey highlighted rows show the associations of the ‘matters’ item with the other variables.

Table S4

Unconditional multilevel models of joyfulness

	2-Level Unconditional Model of PANAS_joyful			3-Level Unconditional Model of PANAS_joyful		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*P*
(Intercept)	3.09	3.03 – 3.16	**<0.001**	3.09	3.02 – 3.16	**<0.001**
Random Effects						
σ^2	0.87			0.74		
τ_{00}	0.45 $_{Study\_ID}$			0.15 $_{ID\_day}$		
				0.43 $_{Study\_ID}$		
ICC	0.34			0.44		
N	427 $_{Study\_ID}$			2524 $_{ID\_day}$		
				427 $_{Study\_ID}$		
Observations	6402			6402		
Marginal R^2 / Conditional R^2	0.000 / 0.339			0.000 / 0.442		

Note: σ^2 = within-person residual variance at Level 1; $\tau_{00\ ID\_day}$ = between-person variance at Level 2, i.e., variation in intercepts across days nested in people; $\tau_{00\ study\_ID}$ = between-person variance at Level 3, i.e., variation in intercepts across people; ICC = variance due to between-person variation; Observations = Level 1 units; N_{ID_day} = Level 2 units, i.e., number of days within participants; N_{study_ID} = Level 3 units, i.e., number of participants; Marginal R^2 = the correlation between fitted and observed values; Conditional R^2 = proportion of variance in the DV accounted for by the IVs.

Table S5

Conditional multilevel models of joyfulness

	PANAS.joyful_EMA			PANAS.joyful_EMA			PANAS.joyful_EMA			PANAS.joyful_EMA		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
(Intercept)	3.09	3.02 – 3.16	**<0.001**	3.09	3.02 – 3.16	**<0.001**	3.09	3.02 – 3.16	**<0.001**	3.09	3.02 – 3.16	**<0.001**
VA matters pcent	0.40	0.37 – 0.43	**<0.001**							0.22	0.19 – 0.25	**<0.001**
VA content pcent				0.38	0.35 – 0.41	**<0.001**				0.13	0.10 – 0.16	**<0.001**
VA person pcent							0.40	0.37 – 0.43	**<0.001**	0.18	0.15 – 0.21	**<0.001**
Random Effects												
σ^2	0.58			0.61			0.62			0.61		
τ_{00}	0.10 ID_day			0.09 ID_day			0.10 ID_day			0.09 ID_day		
	0.45 Study_ID			0.45 Study_ID			0.45 Study_ID			0.45 Study_ID		
τ_{11}	0.06 ID_day.VA.matters.pcent			0.05 ID_day.VA.content.pcent			0.05 ID_day.VA.person.pcent					
	0.02 Study_ID.VA.matters.pcent			0.02 Study_ID.VA.content.pcent			0.02 Study_ID.VA.person.pcent					
ρ_{01}	0.25 ID_day			0.33 ID_day			0.31 ID_day					
	-0.06 Study_ID			-0.08 Study_ID			0.10 Study_ID					
ICC	0.51			0.49			0.49			0.47		
N	2523 ID_day			2523 ID_day			2522 ID_day			2522 ID_day		
	427 Study_ID			427 Study_ID			427 Study_ID			427 Study_ID		
Observations	6393			6382			6385			6372		
Marginal R^2 / Conditional R^2	0.100 / 0.561			0.089 / 0.539			0.084 / 0.532			0.125 / 0.533		

Table S6

Conditional multilevel models of sadness

	PANAS.sad_EMA			PANAS.sad_EMA			PANAS.sad_EMA			PANAS.sad_EMA		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
(Intercept)	1.67	1.62 – 1.73	**<0.001**	1.67	1.62 – 1.73	**<0.001**	1.67	1.62 – 1.73	**<0.001**	1.68	1.62 – 1.73	**<0.001**
VA matters pcent	-0.21	-0.24 – -0.18	**<0.001**							-0.12	-0.14 – -0.09	**<0.001**
VA content pcent				-0.20	-0.22 – -0.17	**<0.001**				-0.06	-0.09 – -0.03	**<0.001**
VA person pcent							-0.22	-0.25 – -0.19	**<0.001**	-0.12	-0.15 – -0.09	**<0.001**
Random Effects												
σ^2	0.45			0.46			0.44			0.48		
τ_{00}	0.11 $_{ID\_day}$			0.11 $_{ID\_day}$			0.11 $_{ID\_day}$			0.11 $_{ID\_day}$		
	0.28 $_{Study\_ID}$			0.28 $_{Study\_ID}$			0.28 $_{Study\_ID}$			0.28 $_{Study\_ID}$		
τ_{11}	0.04 $_{ID\_day.VA.matters.pcent}$			0.03 $_{ID\_day.VA.content.pcent}$			0.06 $_{ID\_day.VA.person.pcent}$					
	0.01 $_{Study\_ID.VA.matters.pcent}$			0.01 $_{Study\_ID.VA.content.pcent}$			0.02 $_{Study\_ID.VA.person.pcent}$					
ρ_{01}	-0.79 $_{ID\_day}$			-0.95 $_{ID\_day}$			-0.78 $_{ID\_day}$					
	-0.68 $_{Study\_ID}$			-0.59 $_{Study\_ID}$			-0.36 $_{Study\_ID}$					
ICC	0.49			0.48			0.50			0.45		
N	2524 $_{ID\_day}$			2524 $_{ID\_day}$			2523 $_{ID\_day}$			2523 $_{ID\_day}$		
	427 $_{Study\_ID}$			427 $_{Study\_ID}$			427 $_{Study\_ID}$			427 $_{Study\_ID}$		
Observations	6393			6382			6385			6372		
Marginal R^2 / Conditional R^2	0.040 / 0.515			0.035 / 0.496			0.036 / 0.517			0.053 / 0.476		

Table S7

Conditional multilevel models of anger

	PANAS.angry_EMA			PANAS.angry_EMA			PANAS.angry_EMA			PANAS.angry_EMA		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
(Intercept)	1.44	1.40 – 1.49	**<0.001**	1.44	1.39 – 1.48	**<0.001**	1.44	1.39 – 1.48	**<0.001**	1.44	1.40 – 1.49	**<0.001**
VA matters pcent	-0.15	-0.17 – -0.12	**<0.001**							-0.07	-0.10 – -0.05	**<0.001**
VA content pcent				-0.14	-0.16 – -0.12	**<0.001**				-0.02	-0.05 – 0.00	0.076
VA person pcent							-0.17	-0.19 – -0.14	**<0.001**	-0.12	-0.14 – -0.09	**<0.001**
Random Effects												
σ^2	0.39			0.39			0.37			0.42		
τ_{00}	0.06 $_{ID\_day}$			0.06 $_{ID\_day}$			0.06 $_{ID\_day}$			0.06 $_{ID\_day}$		
	0.18 $_{Study\_ID}$			0.18 $_{Study\_ID}$			0.18 $_{Study\_ID}$			0.18 $_{Study\_ID}$		
τ_{11}	0.04 $_{ID\_day.VA.matters.pcent}$			0.05 $_{ID\_day.VA.content.pcent}$			0.06 $_{ID\_day.VA.person.pcent}$					
	0.01 $_{Study\_ID.VA.matters.pcent}$			0.00 $_{Study\_ID.VA.content.pcent}$			0.01 $_{Study\_ID.VA.person.pcent}$					
ρ_{01}	-0.95 $_{ID\_day}$			-0.96 $_{ID\_day}$			-0.85 $_{ID\_day}$					
	-0.78 $_{Study\_ID}$			-1.00 $_{Study\_ID}$			-0.65 $_{Study\_ID}$					
ICC	0.42						0.44			0.36		
N	2523 $_{ID\_day}$			2523 $_{ID\_day}$			2522 $_{ID\_day}$			2522 $_{ID\_day}$		
	427 $_{Study\_ID}$			427 $_{Study\_ID}$			427 $_{Study\_ID}$			427 $_{Study\_ID}$		
Observations	6392			6381			6384			6371		
Marginal R^2 / Conditional R^2	0.026 / 0.437			0.039 / NA			0.028 / 0.452			0.037 / 0.388		

Table S8

Conditional multilevel models of ashamed

	PANAS.ashamed_EMA			PANAS.ashamed_EMA			PANAS.ashamed_EMA			PANAS.ashamed_EMA		
Predictors	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*	*Estimates*	*CI*	*p*
(Intercept)	1.43	1.38 – 1.48	**<0.001**	1.43	1.38 – 1.48	**<0.001**	1.43	1.38 – 1.48	**<0.001**	1.44	1.39 – 1.49	**<0.001**
VA matters pcent	-0.13	-0.15 – -0.11	**<0.001**							-0.05	-0.07 – -0.02	**<0.001**
VA content pcent				-0.13	-0.16 – -0.11	**<0.001**				-0.01	-0.04 – 0.01	0.297
VA person pcent							-0.19	-0.22 – -0.16	**<0.001**	-0.17	-0.19 – -0.15	**<0.001**
Random Effects												
σ^2	0.34			0.34			0.31			0.36		
τ_{00}	0.07 $_{ID\_day}$			0.06 $_{ID\_day}$			0.06 $_{ID\_day}$			0.07 $_{ID\_day}$		
	0.22 $_{Study\_ID}$			0.22 $_{Study\_ID}$			0.22 $_{Study\_ID}$			0.22 $_{Study\_ID}$		
τ_{11}	0.03 $_{ID\_day.VA.matters.pcent}$			0.03 $_{ID\_day.VA.content.pcent}$			0.06 $_{ID\_day.VA.person.pcent}$					
	0.01 $_{Study\_ID.VA.matters.pcent}$			0.02 $_{Study\_ID.VA.content.pcent}$			0.02 $_{Study\_ID.VA.person.pcent}$					
ρ_{01}	-0.79 $_{ID\_day}$			-1.00 $_{ID\_day}$			-1.00 $_{ID\_day}$					
	-0.85 $_{Study\_ID}$			-0.54 $_{Study\_ID}$			-0.66 $_{Study\_ID}$					
ICC	0.48			0.48			0.52			0.44		
N	2523 $_{ID\_day}$			2523 $_{ID\_day}$			2522 $_{ID\_day}$			2522 $_{ID\_day}$		
	427 $_{Study\_ID}$			427 $_{Study\_ID}$			427 $_{Study\_ID}$			427 $_{Study\_ID}$		
Observations	6392			6381			6384			6371		
Marginal R^2 / Conditional R^2	0.021 / 0.493			0.021 / 0.492			0.037 / 0.533			0.045 / 0.466		

Table S9

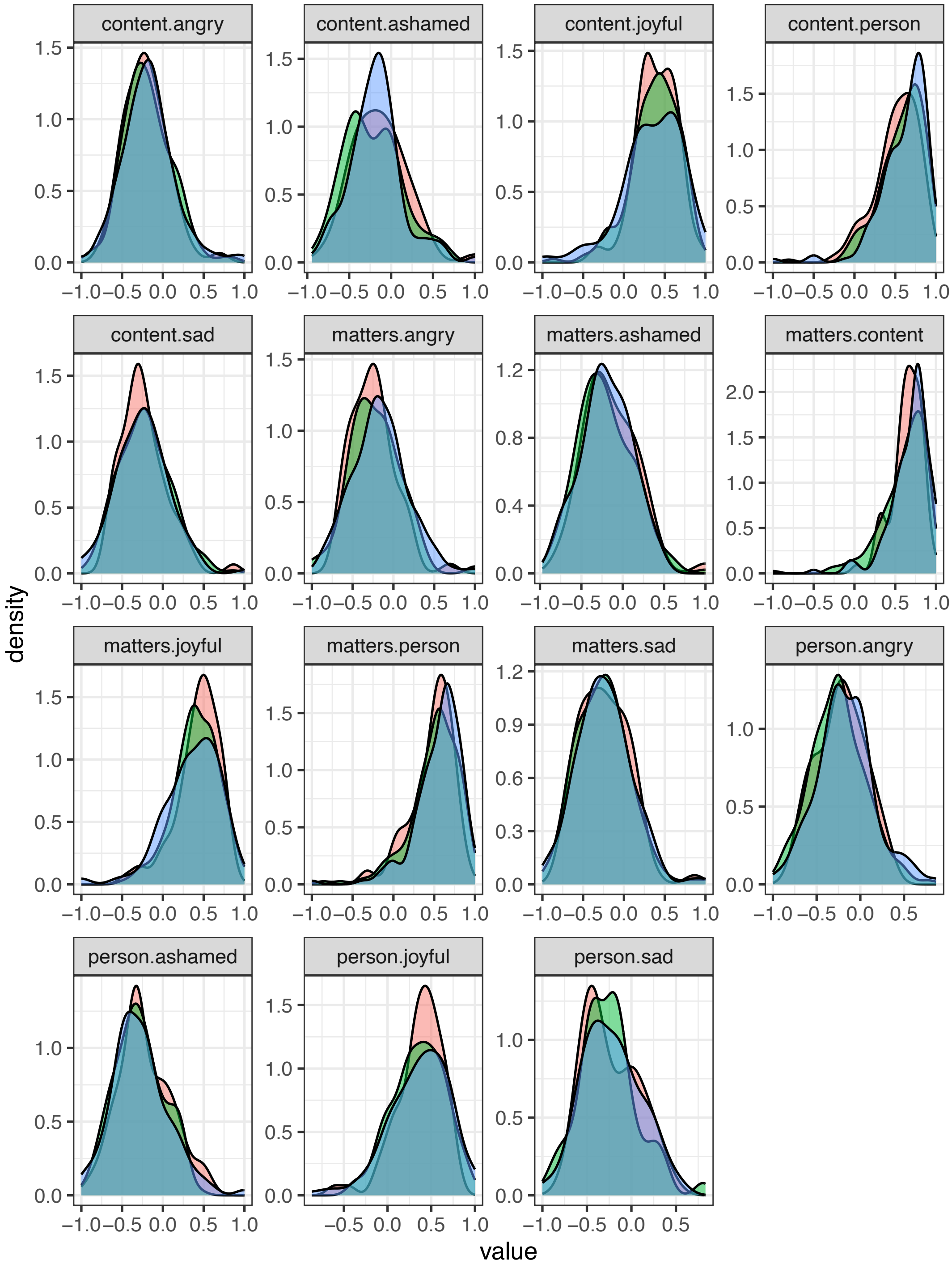
Tests of moderators in multivariate RE-MA models of the four affect outcomes

Outcome: Joyfulness Gender: $F(1, 1237) = 0.0263$, $p = 0.871$ Age: $F(1, 1237) = 1.210$, $p = 0.272$ Sample: $F(2, 1236) = 0.411$, $p = 0.663$ Race: $F(6, 1232) = 0.7116$, $p = 0.640$ Ethnicity: $F(1, 1237) = 1.461$, $p = 0.227$	**Outcome: Sadness** Gender: $F(1, 1147) = 0.213$, $p = 0.645$ Age: $F(1, 1147) = 1.263$, $p = 0.261$ Sample: $F(2, 1146) = 0.464$, $p = 0.629$ Race: $F(6, 1142) = 0.143$, $p = 0.990$ Ethnicity: $F(1, 1147) =0.269$, $p = 0.604$
Outcome: Anger Gender: $F(1, 1042) = 0.299$, $p = 0.585$ Age: $F(1, 1042) = 1.639$, $p = 0.201$ Sample: $F(2, 1041) = 1.063$, $p = 0.346$ Race: $F(5, 1038) = 0.287$, $p = 0.920$ Ethnicity: $F(1, 1042) = 0.255$, $p = 0.614$	**Outcome: Ashamed** Gender: $F(1, 976) = 0.268$, $p = 0.605$ Age: $F(1, 976) = 2.136$, $p = 0.144$ Sample: $F(2, 975) = 1.301$, $p = 0.273$ Race: $F(5, 972) = 1.807$, $p = 0.101$ Ethnicity: $F(1, 976) = 0.166$, $p = 0.683$

Section 2: Figures

Figure S1

Density plots of the inter-correlations of the valued action and affect items in the three samples



Note. The densities of the three samples shown in different colours overlap substantially for each within-person correlation.

Figure S2

Missingness map of the longitudinal data with the variables on the x-axis, participant ID on the y-axis, and the white spaces indicating missingness

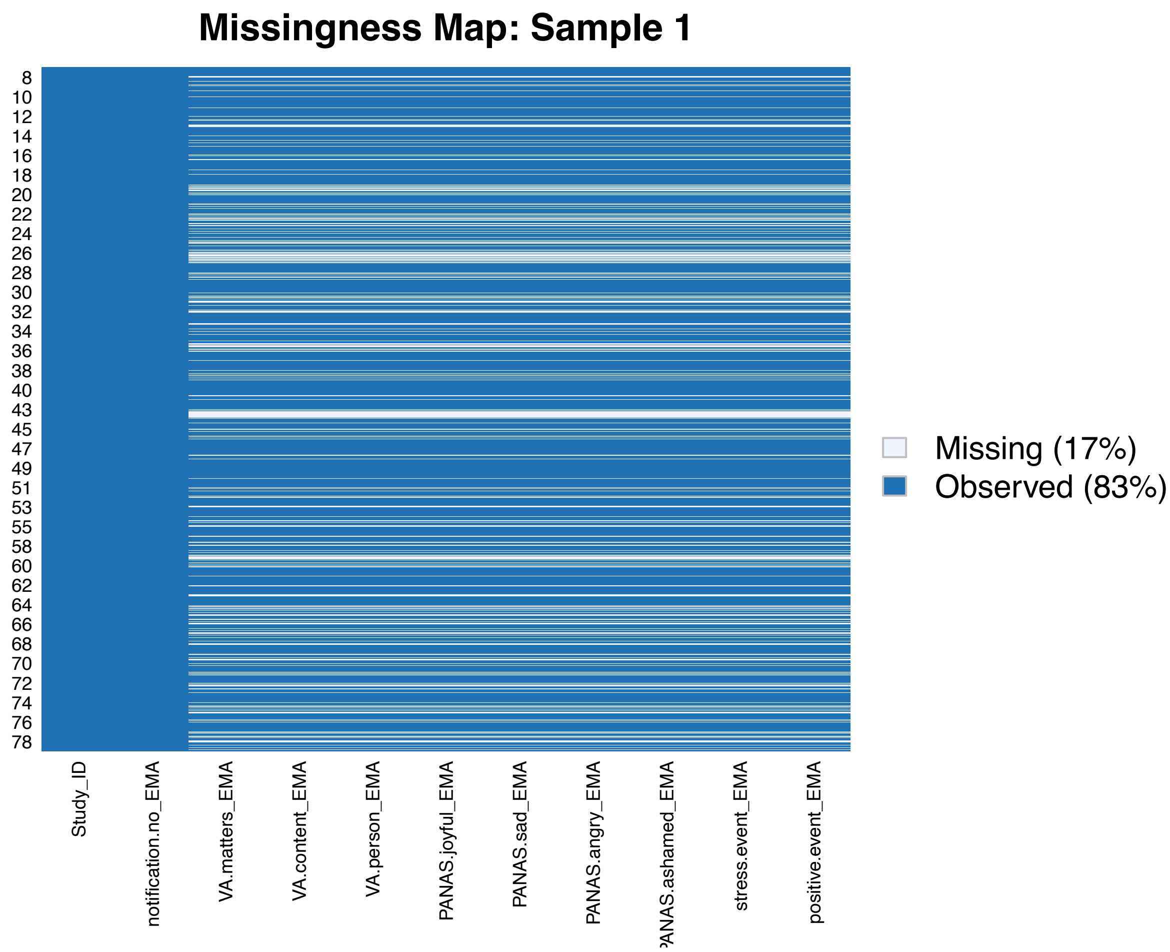


Figure S3

Missingness map of the longitudinal data with the variables on the x-axis, participant ID on the y-axis, and the white spaces indicating missingness

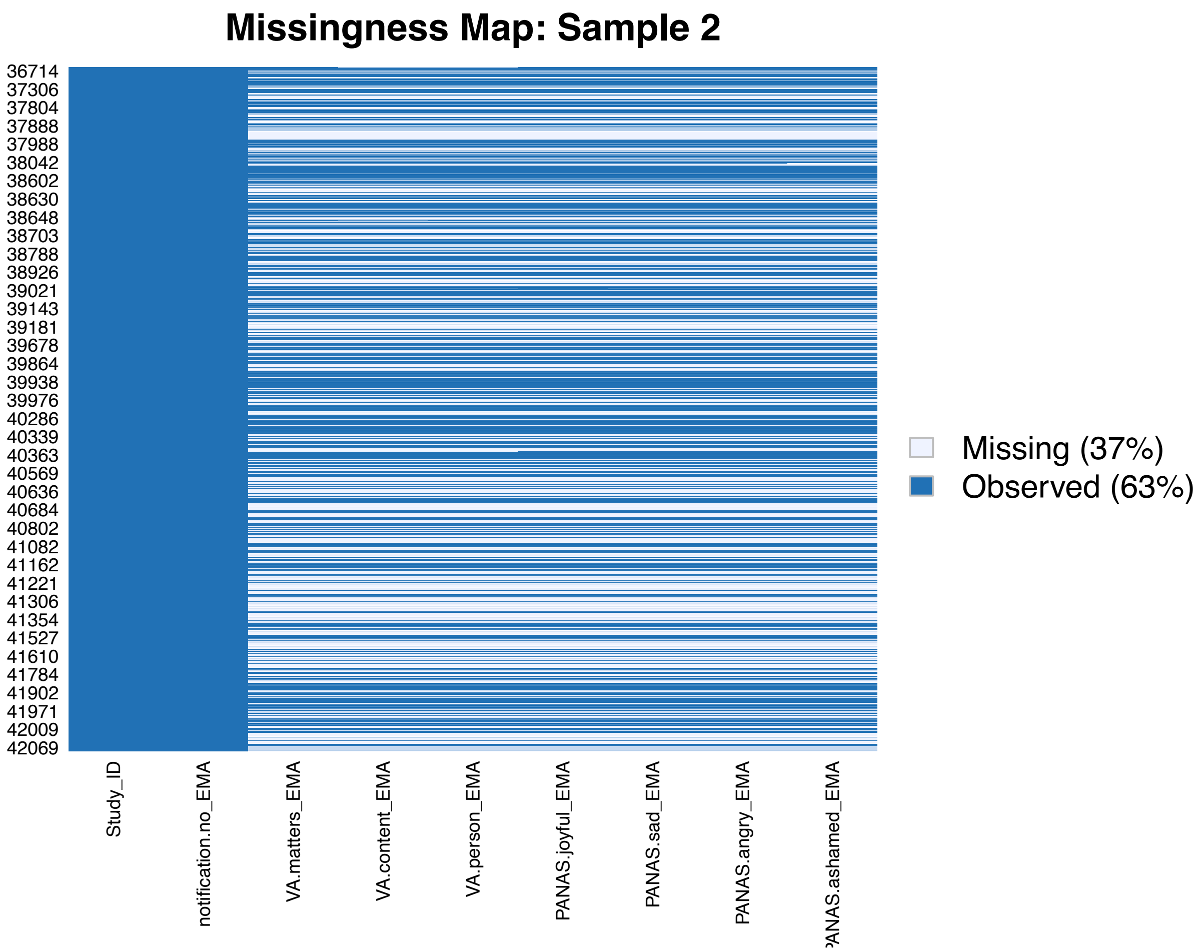


Figure S4

Missingness map of the longitudinal data with the variables on the x-axis, participant ID on the y-axis, and the white spaces indicating missingness

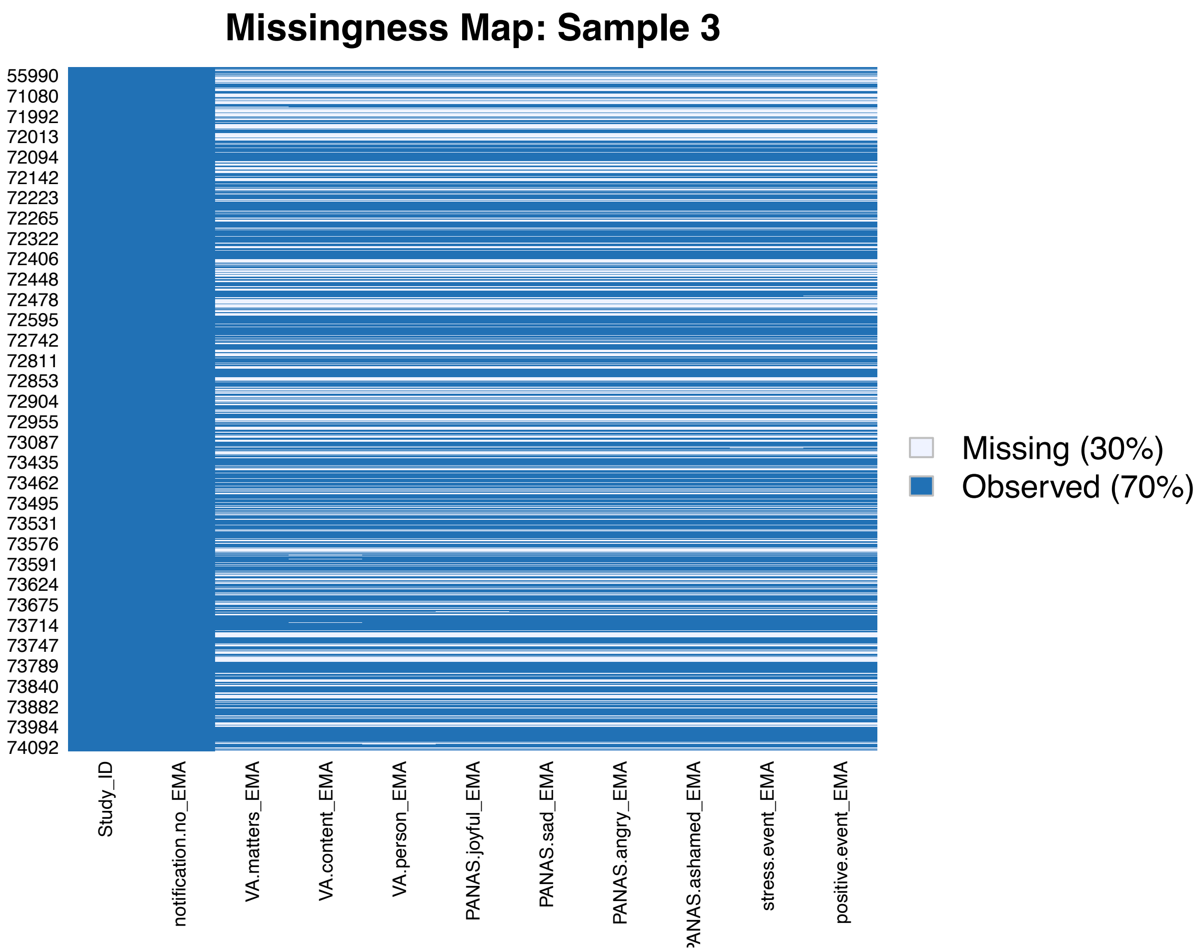
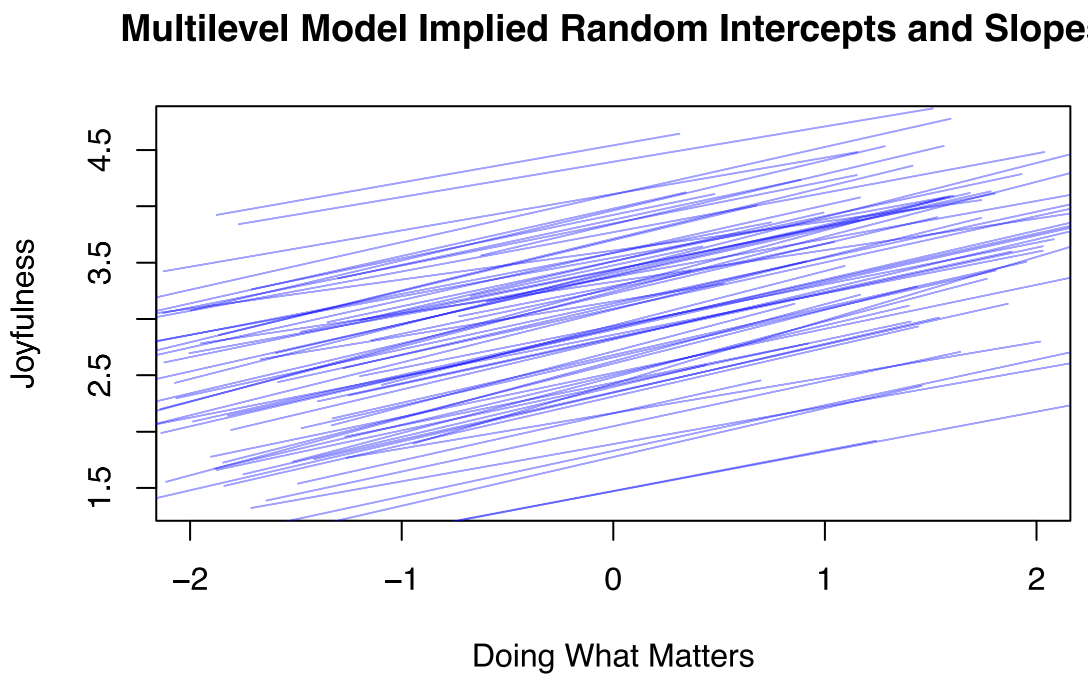


Figure S5

Multilevel model implied random intercepts and slopes of 'doing what matters' predicting joyfulness (top panel) and sadness (bottom panel) in daily life



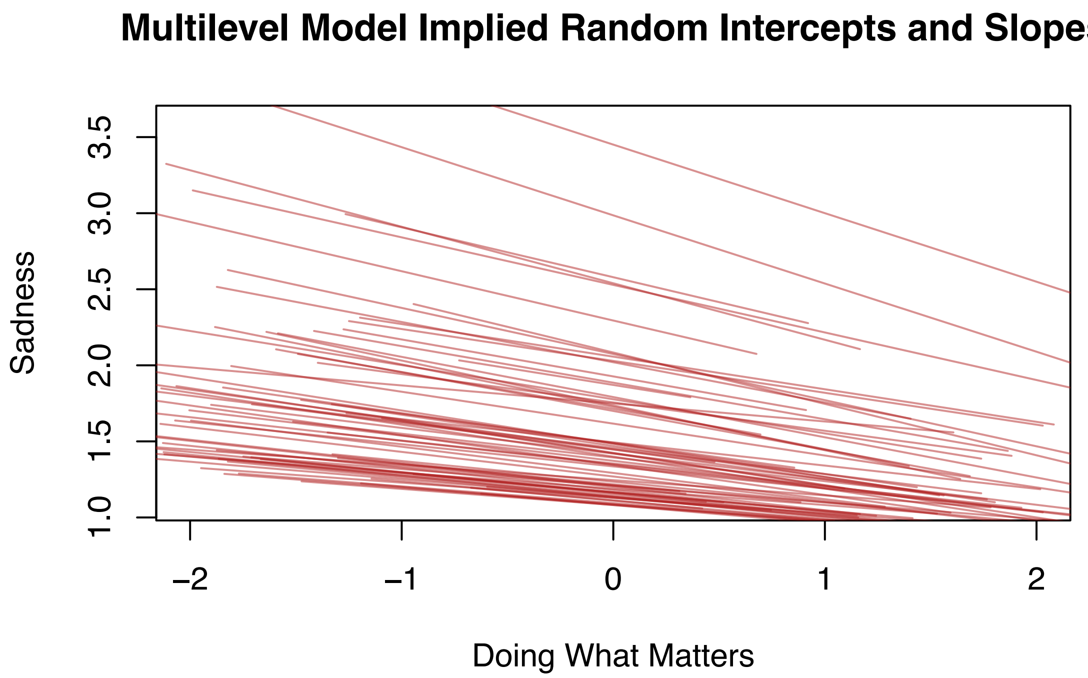
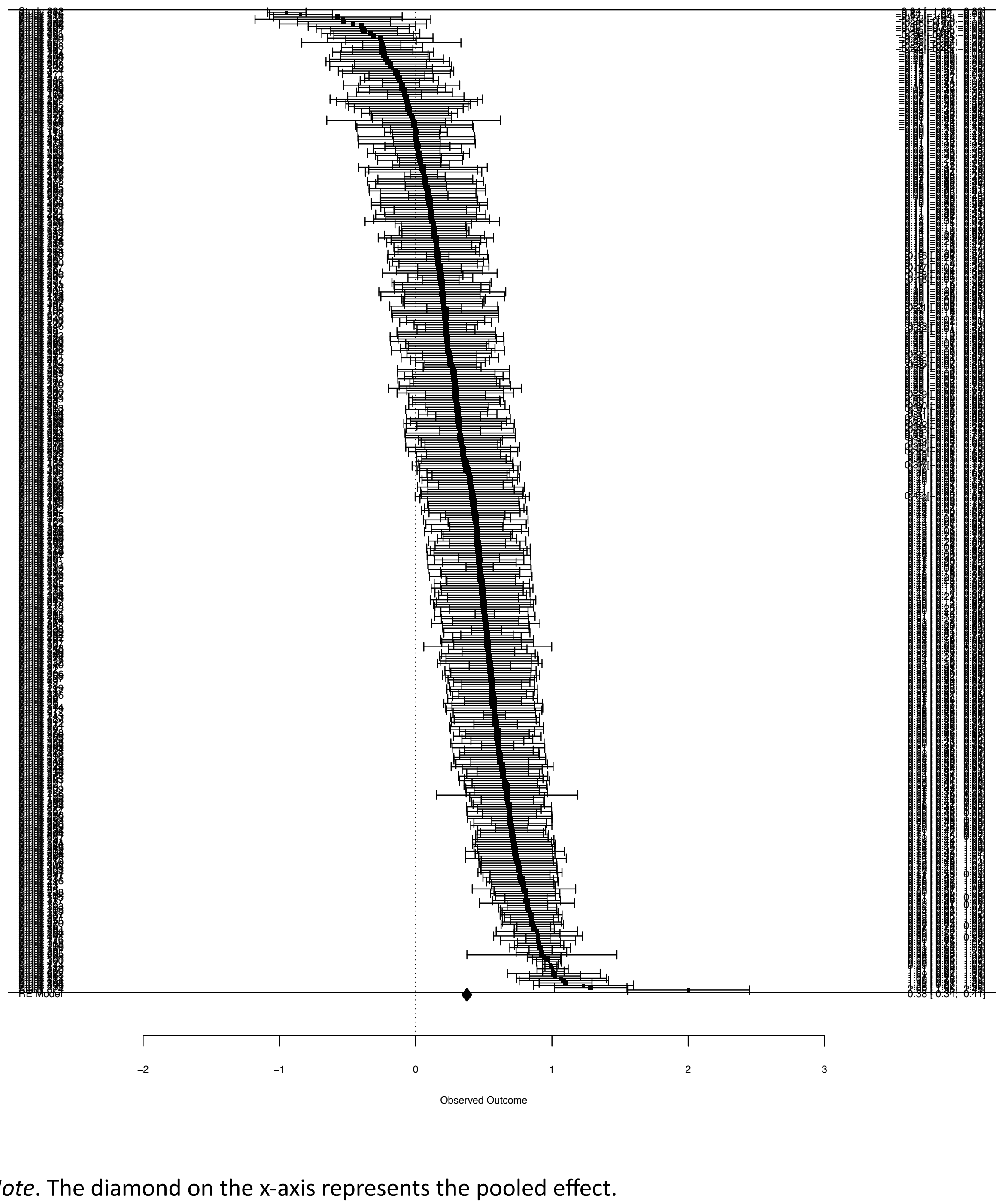


Figure S6

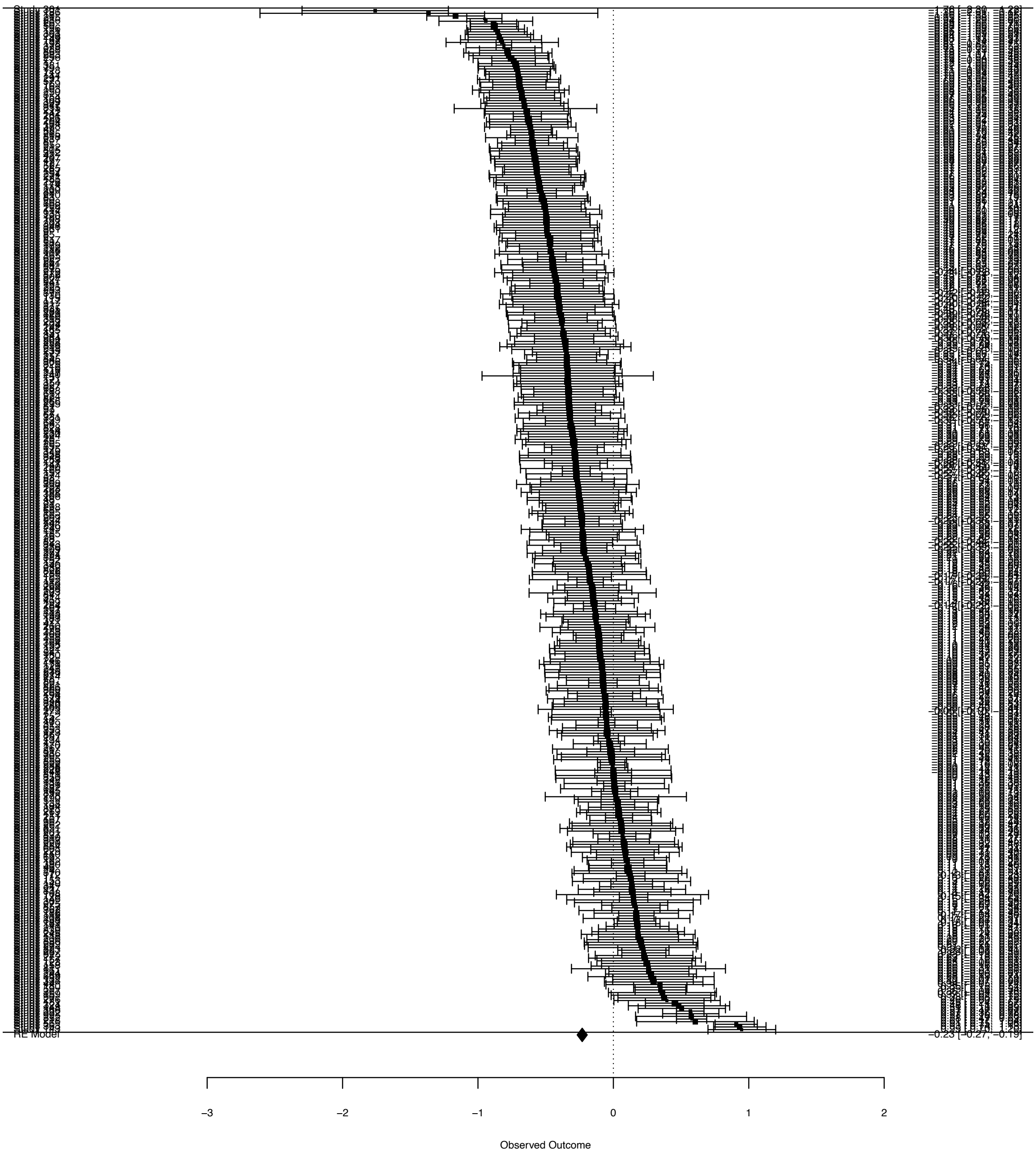
Forest plot of RE-MA of the i-ARIMAX estimates of 'doing what matters' predicting joyfulness



Note. The diamond on the x-axis represents the pooled effect.

Figure S7

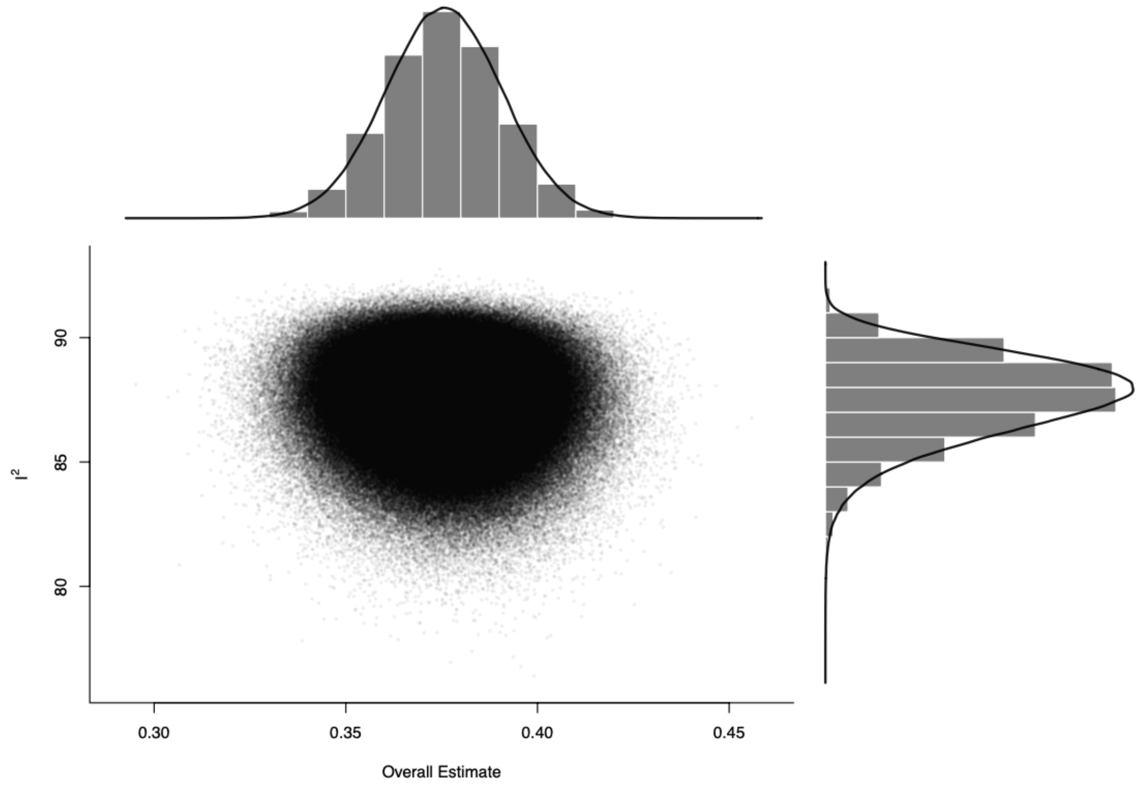
Forest plot of RE-MA of the i-ARIMAX estimates of 'doing what matters' predicting sadness



Note. The diamond on the x-axis represents the pooled effect.

Figure S8

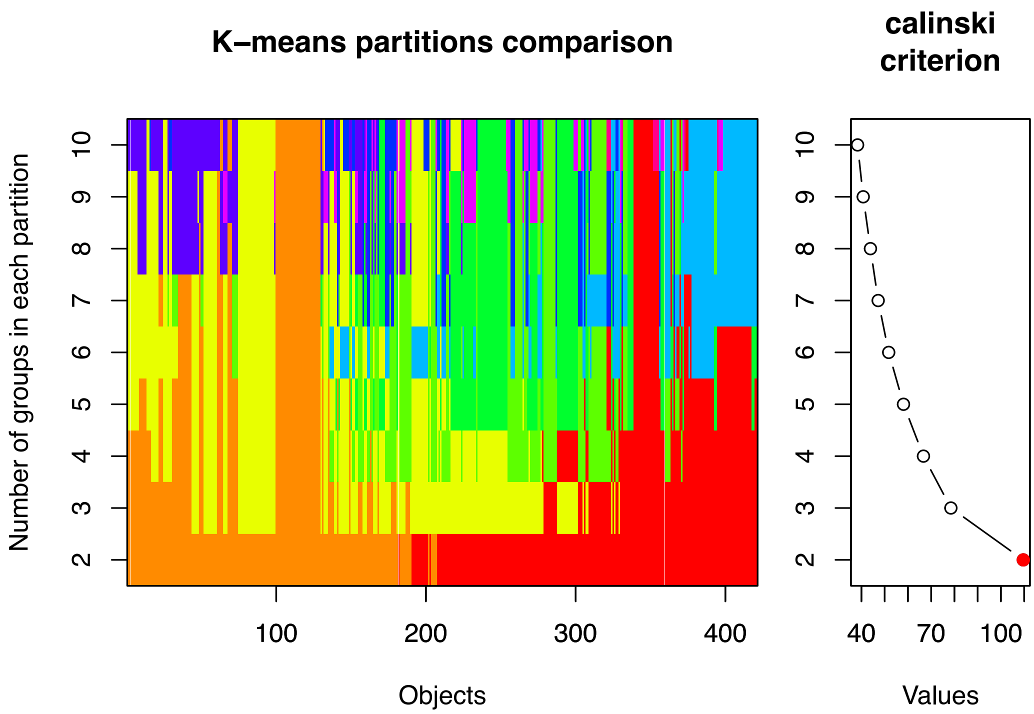
GOSH plot of the RE-MA of i-ARIMAX estimates of 'doing what matters' predicting joyfulness in daily



Note. The x-axis plotted pooled effect estimates from a million meta-analysis models run with different random combinations of participants and the y-axis represented the I^2 from those models. The plot showed a roughly symmetric, homogeneous distribution of the points in the middle, which were concentrated in a single cluster. The histograms on the top and the right showed that both the effect sizes and I^2, respectively, from these random models were normally distributed and were not bi-model, for instance, if we had two clusters of effects with varying heterogeneity. Models at the lowest or highest ends of the x-axis generally had comparable levels of heterogeneity. The range of the pooled estimates from these models was narrow. There was no evidence of outliers that biased the pooled effect or I^2 estimates.

Figure S9

K-means cluster analyses of the i-ARIMAX estimates of 12 pairs of valued-action and affect using the Calinsky criterion (top) and silhouette plot from the pam-algorithm (bottom)



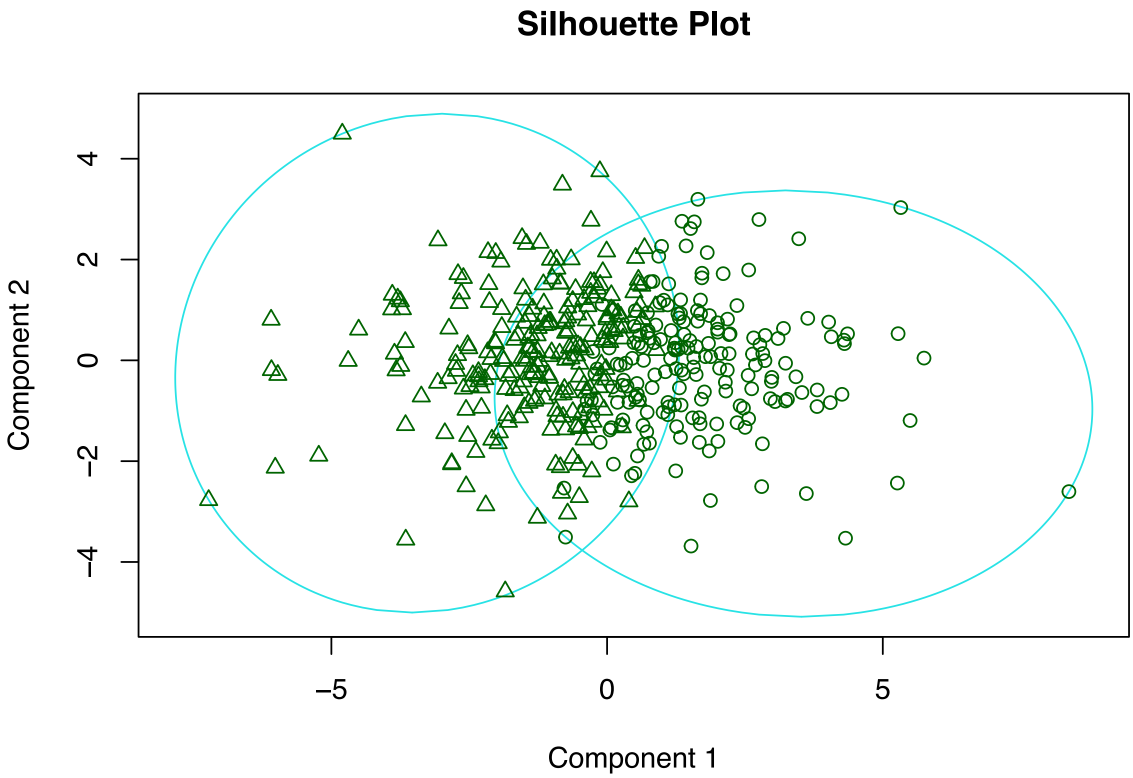
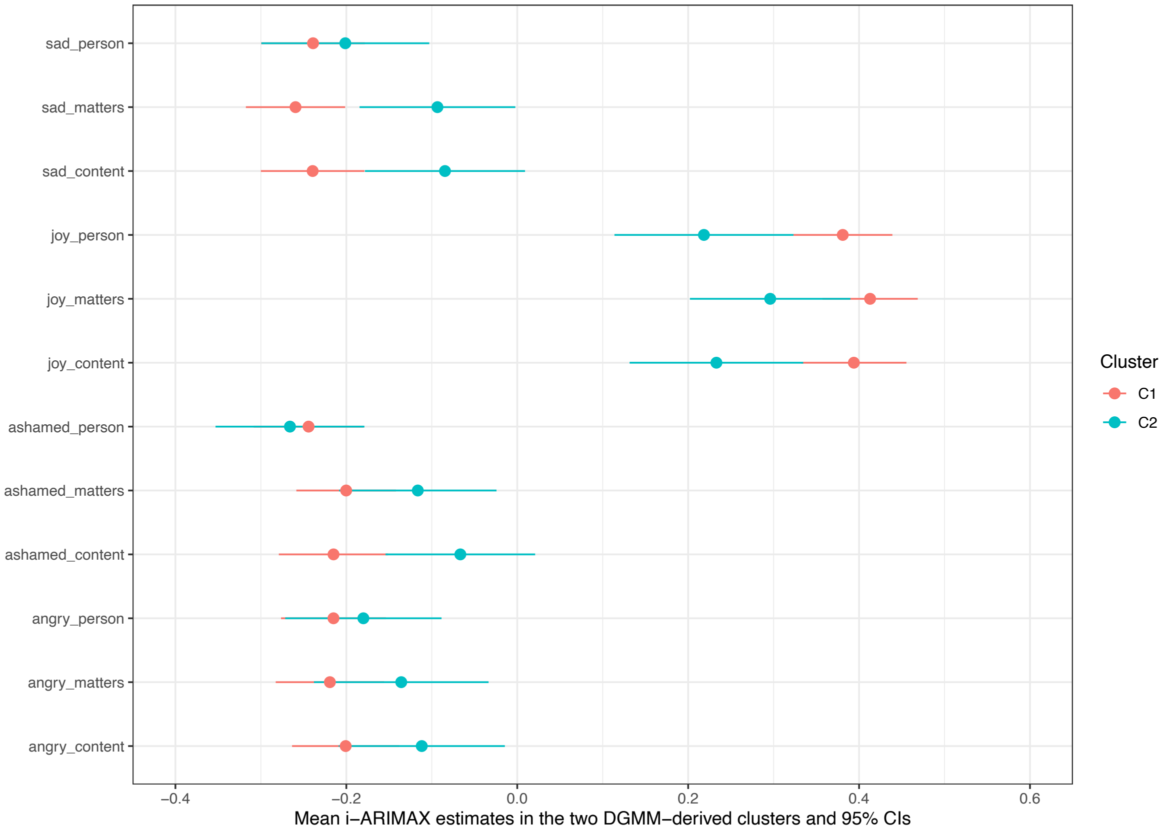


Figure S10

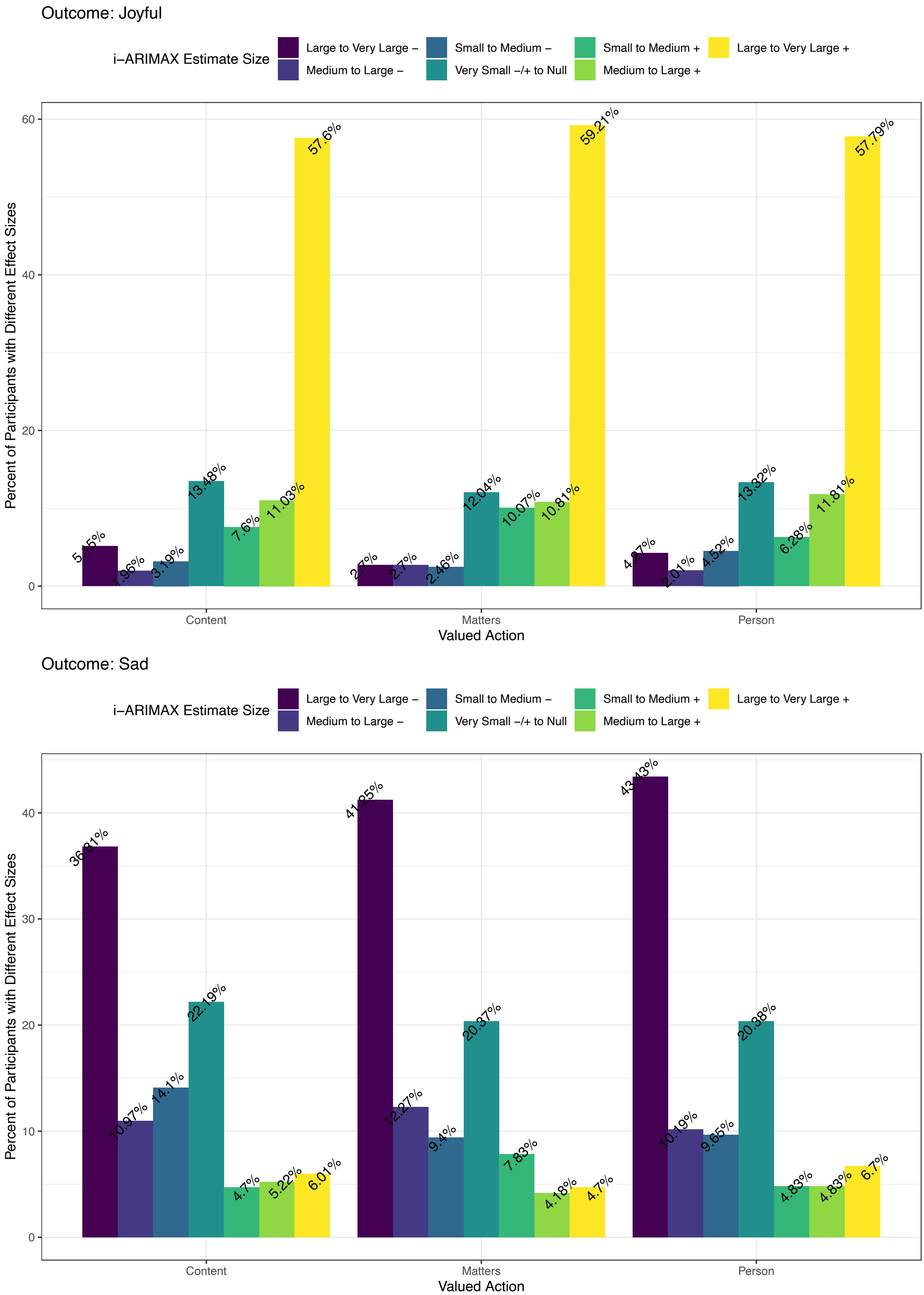
Mean i-ARIMAX estimates in the DGMM-derived clusters and 95% confidence intervals

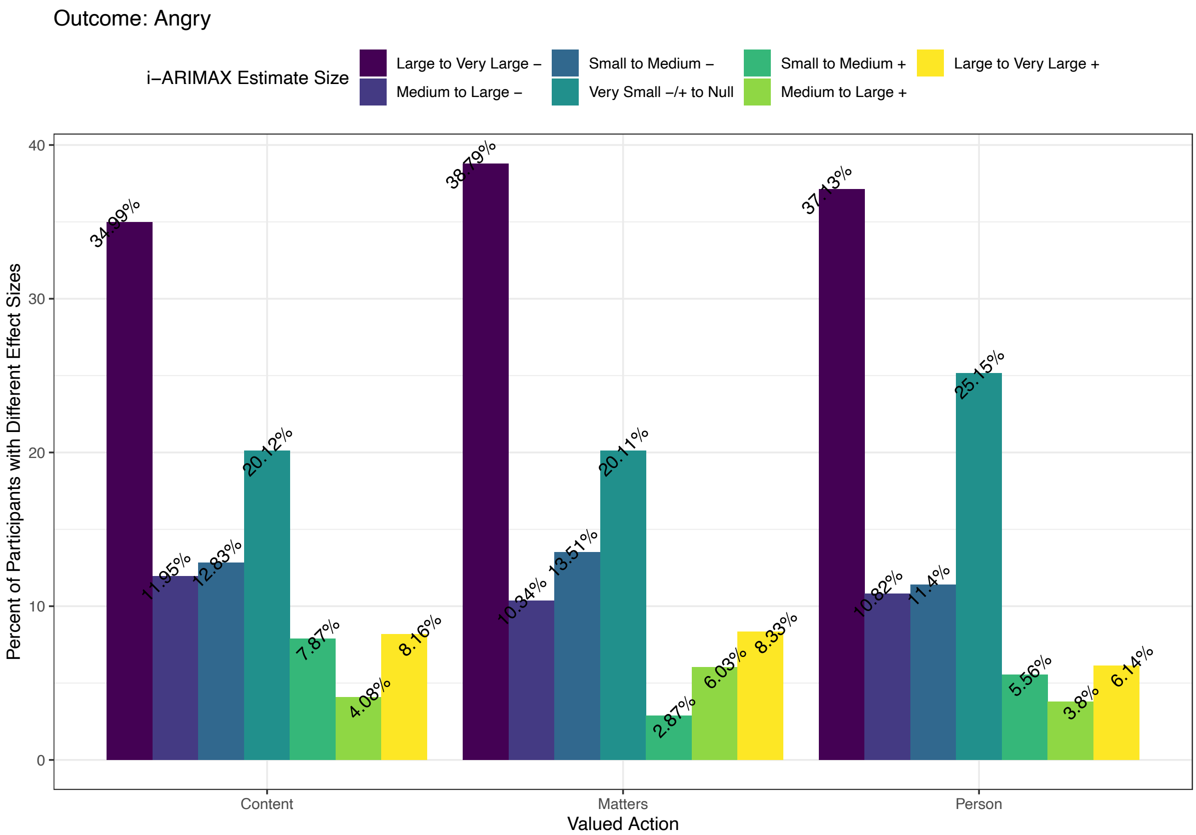


Note. Cluster 1 (pink): *n*=314; 74.58% of the sample; Cluster 2 (blue): *n*=107; 25.42% of the sample. Cluster member did not differ by gender (X^2 (1, N = 412) = 0.391, p = 0.532), race (X^2 (6, N = 412) = 5.106, p = 0.530), or ethnicity (X^2 (1, N = 412) = 1.536, p = 0.215).

Figure S11

Distribution of i-ARIMAX effect sizes in different categories of effect size for the four outcomes




Outcome: Angry
i–ARIMAX Estimate Size
Large to Very Large –
Medium to Large –
Small to Medium –
Very Small –/+ to Null
Small to Medium +
Medium to Large +
Large to Very Large +
Percent of Participants with Different Effect Sizes
0
10
20
30
40
34.99%
11.95%
12.83%
20.12%
7.87%
4.08%
8.16%
38.79%
10.34%
13.51%
20.11%
2.87%
6.03%
8.33%
37.13%
10.82%
11.4%
25.15%
5.56%
3.8%
6.14%
Content
Matters
Person
Valued Action

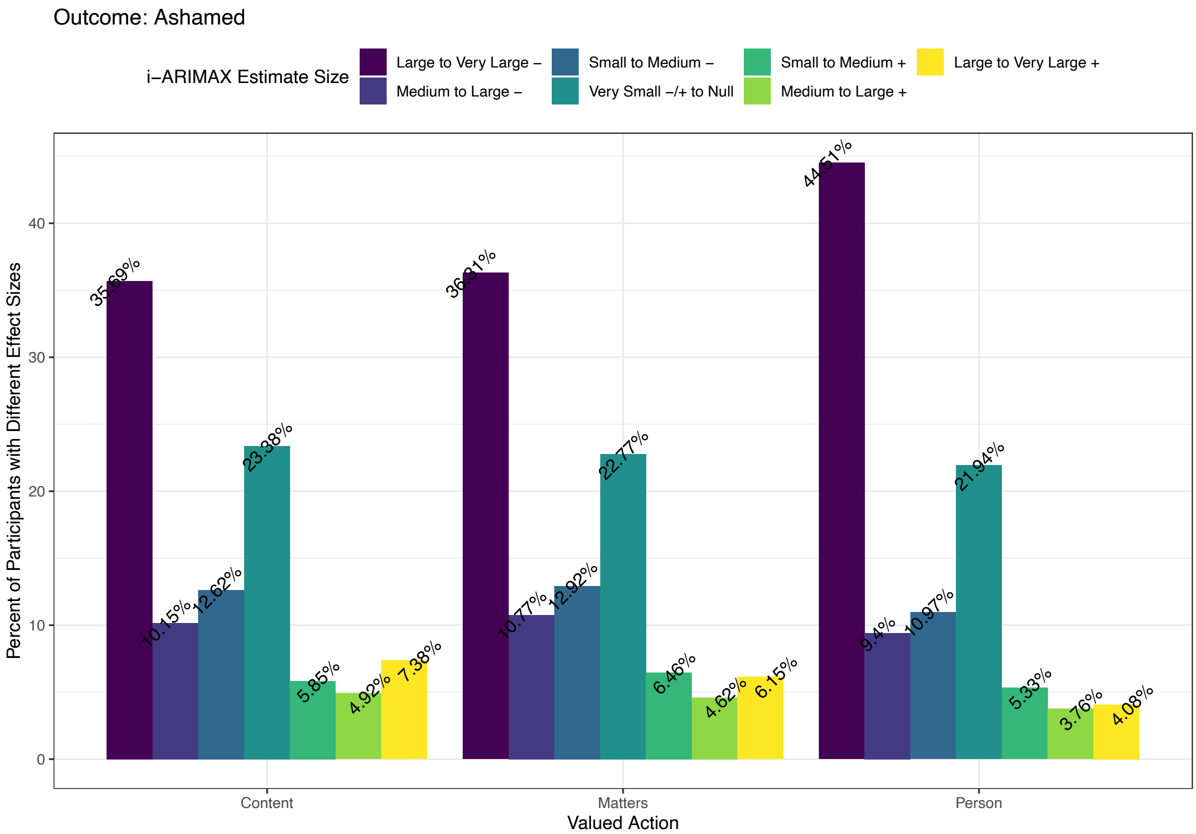
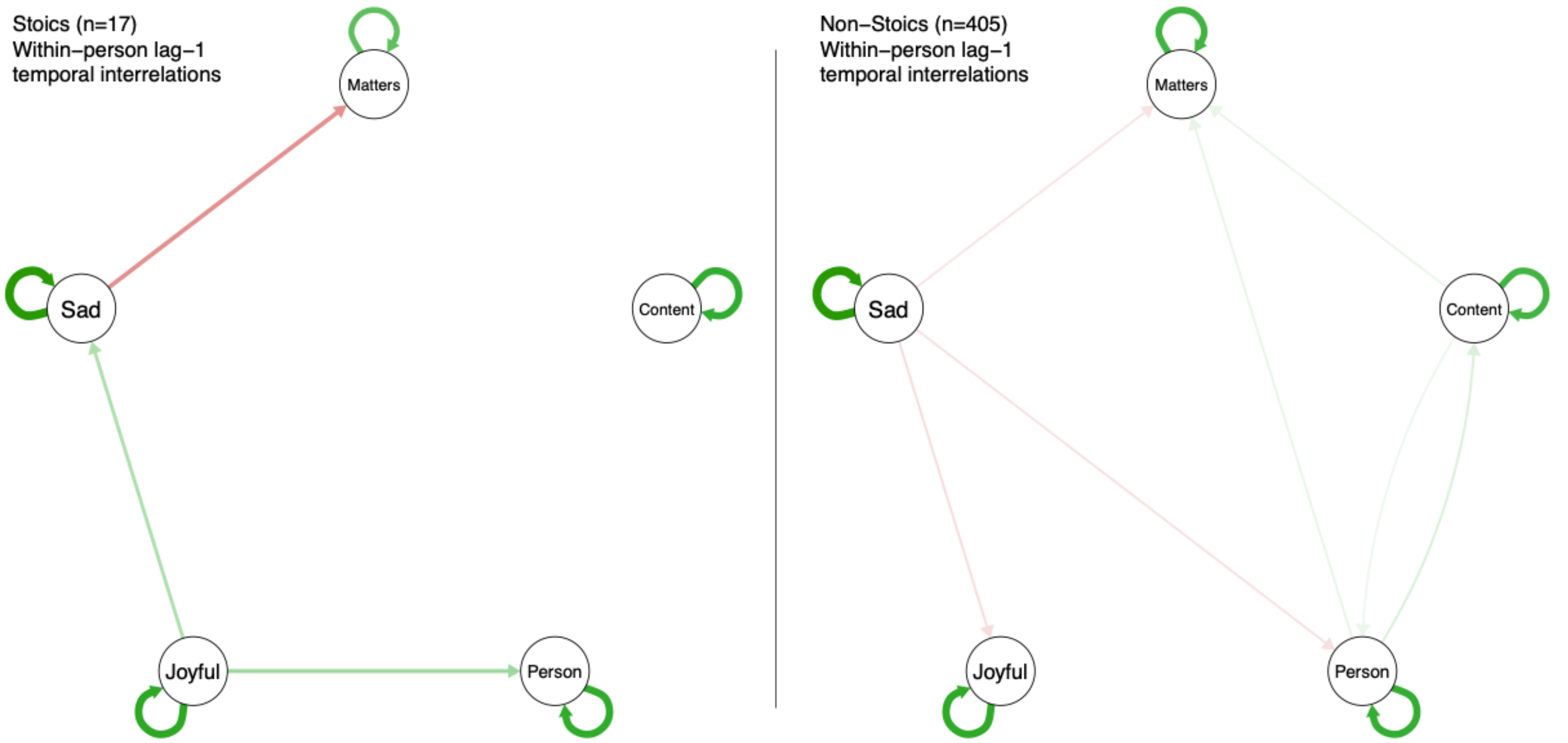

Outcome: Ashamed
i–ARIMAX Estimate Size
Large to Very Large –
Medium to Large –
Small to Medium –
Very Small –/+ to Null
Small to Medium +
Medium to Large +
Large to Very Large +
Percent of Participants with Different Effect Sizes
0
10
20
30
40
35.69%
10.15%
12.62%
23.38%
5.85%
4.92%
7.38%
36.31%
10.77%
12.92%
22.77%
6.46%
4.62%
6.15%
44.51%
9.4%
10.97%
21.94%
5.33%
3.76%
4.08%
Content
Matters
Person
Valued Action

Figure S12

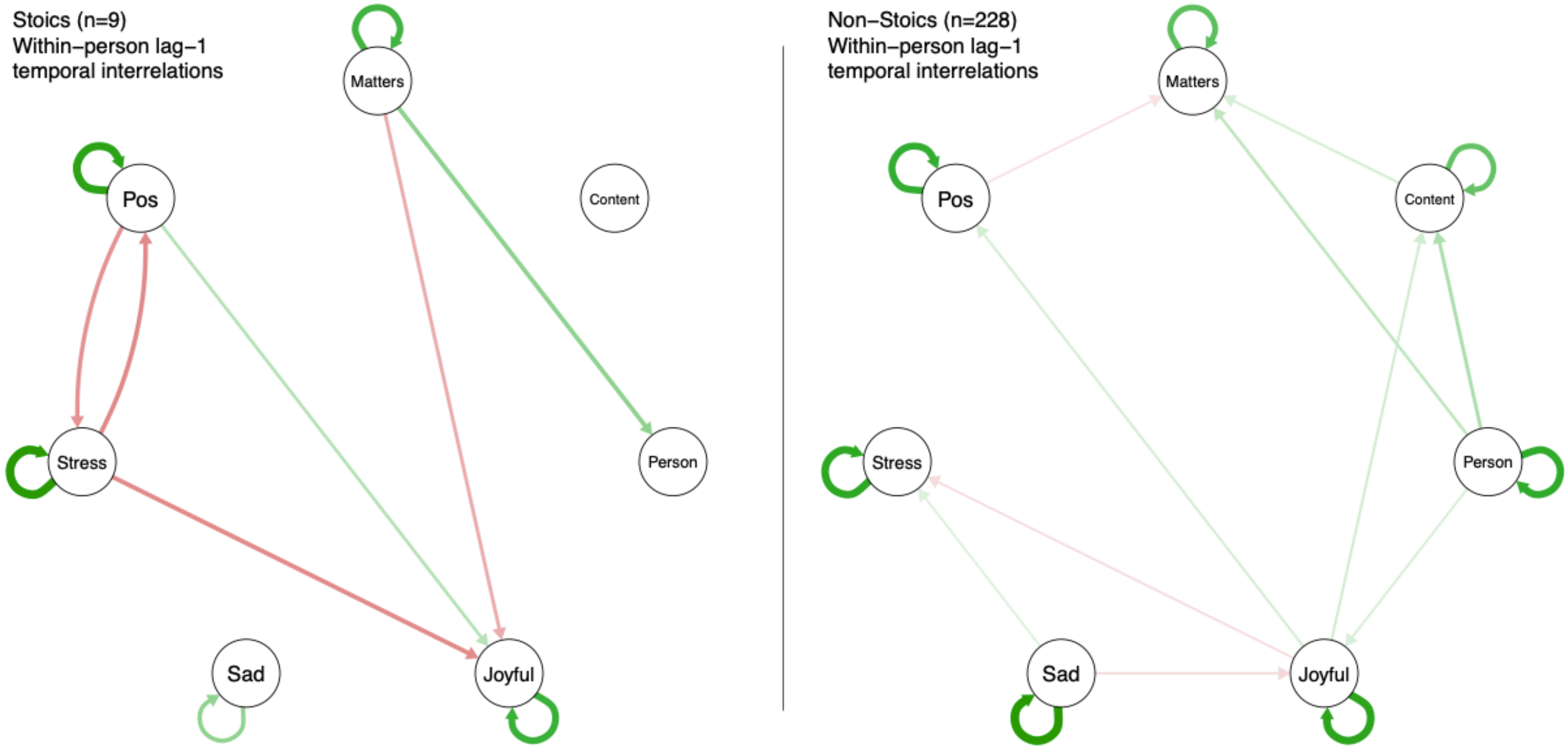
Temporal (lag-1) networks from multilevel-VAR models of valued action, joy and sadness



Note. These networks are based on the pooled data from three samples. Matters = 'Doing what matters' item of valued action; Content = 'How content were you' item; and Person = 'The kind of person you want to be' item.

Figure S13

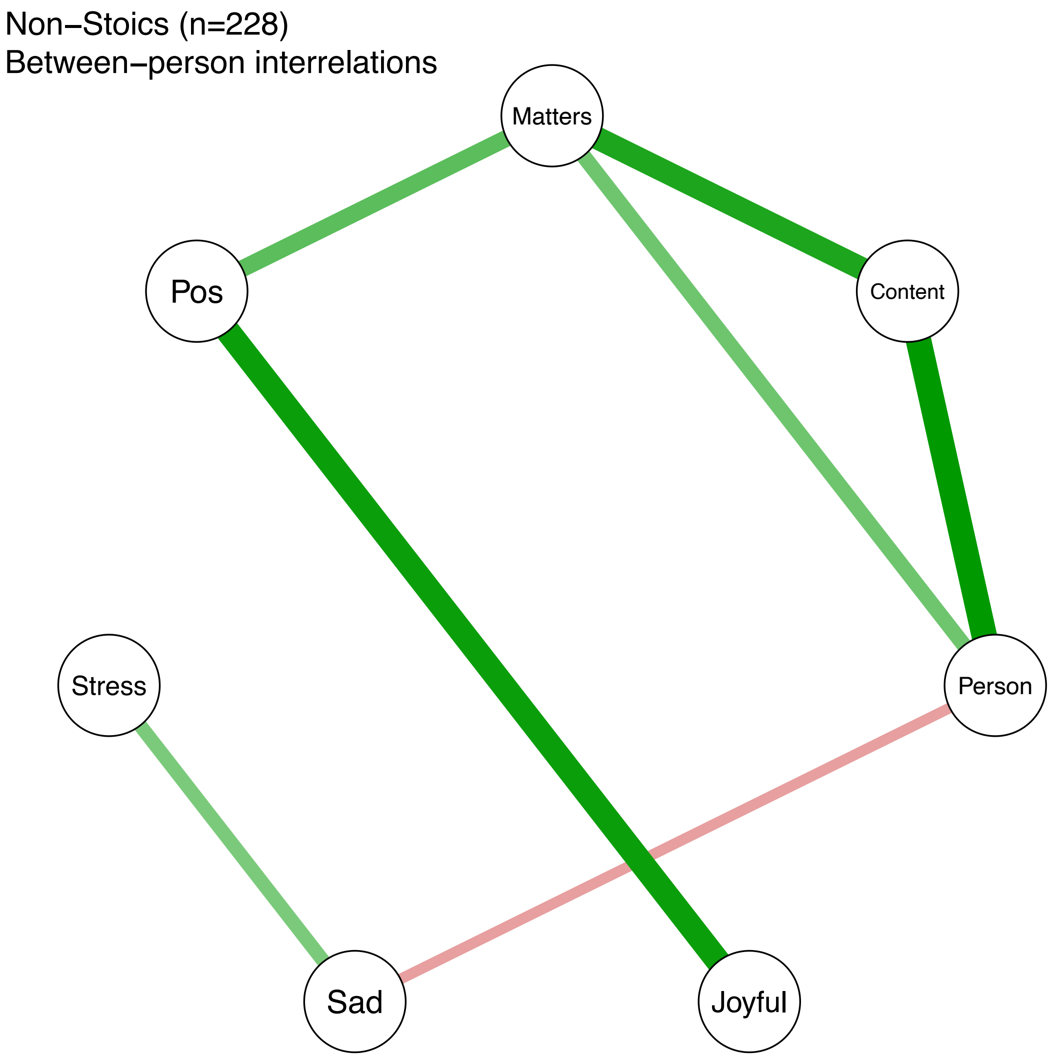
Temporal (lag-1) networks from multilevel-VAR models of valued-action, joy, sadness, stressful events and positive events



Note. Matters = 'Doing what matters' item of valued action; Content = 'How content were you' item; Person = 'The kind of person you want to be' item; Stress = The context of stressful events in daily life; and Pos = The context of positive events in daily life.

Figure S14

Between-person network of the Non-Stoics from a multilevel-VAR model of valued-action, joy, sadness, stressful events and positive events



Note. Matters = 'Doing what matters' item of valued action; Content = 'How content were you' item; Person = 'The kind of person you want to be' item; Stress = The context of stressful events in daily life; and Pos = The context of positive events in daily life.

Section 3: R Code

This section contains sample R code for the idionomic methods used in this study. The code assumes some proficiency in using R. The text beginning with a '#' are annotations.

```
# Load the data and relevant R packages ####

# Load the long-form data with missing data imputed
load("dLi.RData")
# Load the person-level wide-form data
load("personLevel.RData")

library(tidyverse) # for data tidyverse coding
library(lme4) # for lmer
library(afex) # for p-values in lmer
library(sjPlot) # for MLM tables
library(forecast) # for arima
library(metafor) # for rma
# if (!require("devtools")) {
#   install.packages("devtools")
# }
# devtools::install_github("MathiasHarrer/dmetar")
library(dmetar) # for var.comp
library(deepgmm) # for deepgmm
library(vegan) # for cascadeKM
library(fpc) # for pamk
library(mlVAR) # for mlVAR

# Standardizing each time series separately for each person ####

# Save the results in an object "scaled_data_by_id" for later use
scaled_data_by_id <- dLi %>%
  # run computations separately for each ID
  group_by(Study_ID) %>%
  # remove the variable "Time"
  dplyr::select(-Time) %>%
  # standardize the time series
  mutate(across(.cols = everything(), ~ scale(.))) %>%
  # turn the results in a usable data frame
  as.data.frame() %>%
  ungroup()

# Variances of time series ####

# Save the results of the computation in an object "dVar" for later use
dVar <- dLi %>%
  # remove the variable "Time"
  select(-Time) %>%
  # run computations separately for each ID
  group_by(Study_ID) %>%
  # save the variances of the time series
  summarise(across(.cols = everything(), ~ var(.))) %>%
  ungroup()

# i-ARIMAX ####

# The code below runs the i-ARIMAX algorithm for valued-action—matters item
predicting joyfulness. It makes use of the within-person standardized time
series and calculations of the variances of each time series for each perso
n done above.
```

```
# Save the results in an object "joy_matters" for later use
joy_matters <- scaled_data_by_id %>%
  # using scaled data created above, select the relevant time series
  dplyr::select(Study_ID, VA_Matters, Joyful) %>%
  # pull the IDs that have variances > 0.01 for the two time series
  filter(Study_ID %in% (
    dVar %>% filter(VA_Matters > 0.01 &
                    Joyful > 0.01) %>%
      pull(Study_ID)
  )) %>%
  # run the ARIMAX model separately for each ID
  group_by(Study_ID) %>%
  # for each ID, run auto-arima and extract the estimate and standard error
in a tidy data format
  group_modify(~ broom::tidy(
    auto.arima(
      y = .$Joyful,
      xreg = .$VA_Matters,
      stepwise = FALSE,
      approximation = FALSE,
      parallel = TRUE # if multiple processors available
    )
  ) %>%
    filter(term == "xreg"))

# Random-effects meta-analysis ####

# Save the results in an object "meta" for later use
meta <- joy_matters %>%
  # join the joy_matters object created above with the person-level data
  left_join(
    personLevel %>%
      dplyr::select(Study_ID, Sample, EMA_num, age, gender, ethnicity, race
),
    by = "Study_ID"
  ) %>%
  # run a random-effects meta-analysis
  rma(
    yi = estimate,
    sei = std.error,
    knha = TRUE,
    # for each of the terms below run the meta-analysis again with the '#'
sign removed, separately for each line, for sensitivity or moderation tests

    # run a model with number of EMA completed as a sensitivity test
    # weights = EMA_num,

    # the lines below use different variables as moderators
    # mods = Sample,
    # mods = age,
    # mods = gender,
    # mods = ethnicity,
    # mods = race,
    # to use multiple moderators in a single test
    # mods = as_tibble(age, gender, ethnicity, race),

    # use the merged data created earlier to run the meta-analysis
    data = .
  )
```

```
# Summarize the results of the meta-analysis
summary(meta)

# Create a 95% prediction interval
predict(meta, level = 0.95, digits = 3)

# Make a GOSH plot: This step can take hours depending on the power of the
computer. If multiple processors are available, use parallel computing. E.g
., the code below uses 6 clusters on a Mac computer.
gosh(meta, parallel = "snow", ncpus = 6)

# Make a radial plot
radial(meta, center = TRUE, main = "Radial plot")

# Multivariate random-effects meta-analysis ####

# Create a single long-form data file containing the i-ARIMAX estimates fro
m the models of the three items of valued action
joy_merge <- rbind(joy_matters, joy_content, joy_person)

# Use the merged file to run a 3-level multivariate RE-MA with weights
meta_w_imp <- joy_merge %>%
  left_join(
    personLevel %>% dplyr::select(Study_ID, Sample, EMA_num, age, gender, e
thnicity, race),
    by = "Study_ID"
  ) %>%
  rma.mv(
    yi = estimate,
    V = V,
    W = EMA_num,
    # total number of EMA completed as weights
    #mods = ~Sample, # specify the moderator if relevant
    data = .,
    random = ~ 1 | Study_ID / Est_ID,
    # 3-level nesting
    #sigma2 = c(0, NA) # this is applicable only in 2-level model
    test = "t",
    method = "REML"
  )

summary(meta_w_imp)

predict(meta_w_imp, level = 0.95, digits = 3)

# within- and between-person variance components
var.comp(meta_w_imp)

# Cluster Analysis ####

# DGMM ####

# Select the model specification to be used according to best fit
sel <-
  model_selection(
    scaled_clust,
    layers = 3,
    g = 2,
    seeds = c(1, 2),
    it = 250,
    eps = 0.001,
```

```
    init = "mclust",
    criterion = "BIC"
  )
sel
summary(sel)
# The best solution had the following features:
# # Seed = 1, k = 2 1 1, r = 4 2 1, BIC: 12949.42, AIC: 12302.6
# These are used in the final model below.

deepgmm1 <-
  deepgmm(
    scaled_clust,
    layers = 3,
    k = c(2, 1, 1),
    r = c(4, 2, 1),
    init = "mclust",
    init_est = "factanal",
    seed = 2
  )

# Summarize the results
summary(deepgmm1)

# Number of individuals in each cluster
table(deepgmm1$s[, 1])

# Proportion in each cluster
prop.table(table(deepgmm1$s[, 1]))

# K-means ####

set.seed(13)
calfit <- cascadeKM(scaled_clust, 1, 10, iter = 1000)
# number of clusters in best solution
as.numeric(which.max(calfit$results[2, ]))

set.seed(13)
pambest <- pamk(scaled_clust)
pambest$nc # number of clusters in the best solution

# mlVAR ####

# Select the Stoic group's IDs
joyImpNeg <-
  rbind(joy_matters_imp, joy_content_imp, joy_person_imp) %>%
  filter(estimate <= -0.3)
sadImpPos <-
  rbind(sad_matters_imp, sad_content_imp, sad_person_imp) %>%
  filter(estimate >= 0.3)
stoics <- joyImpNeg %>%
  filter(Study_ID %in% sadImpPos$Study_ID) %>%
  pull(Study_ID) %>%
  unique()
length(stoics) # 17

# Get the data of the relevant variables for the Stoic group
stocis3samples <- dLi3samples %>%
  filter(Study_ID %in% stoics) %>%
  dplyr::select(Study_ID, VA_Matters, VA_Content, VA_Person, Joyful, Sad) %
>%
  rename(
```

```
    Matters = VA_Matters,
    Content = VA_Content,
    Person = VA_Person,
    Joyful = Joyful,
    Sad = Sad
  )
length(unique(stocis3samples$Study_ID)) # 17

# Get the data of the relevant variables for the Non-Stoic group
nonstocis3samples <- dLi3samples %>%
  filter(!Study_ID %in% stoics) %>%
  dplyr::select(Study_ID, VA_Matters, VA_Content, VA_Person, Joyful, Sad) %
>%
  rename(
    Matters = VA_Matters,
    Content = VA_Content,
    Person = VA_Person,
    Joyful = Joyful,
    Sad = Sad
  )
length(unique(nonstocis3samples$Study_ID)) # 405

# Run mlVAR model on the data of the Stoics
mlVARstoics <- mlVAR(
  data = stocis3samples,
  vars = c("Matters", "Content", "Person", "Joyful", "Sad"),
  idvar = "Study_ID",
  lags = 1
)
# Summarize the results
summary(mlVARstoics)

# Plot the networks
plot(
  mlVARstoics,
  "contemporaneous",
  title = "Stoics (n=17)\nWithin-person interrelations",
  layout = "circle",
  nonsig = "hide"
)
plot(
  mlVARstoics,
  "temporal",
  title = "Stoics (n=17)\nWithin-person lag-1\ntemporal interrelations",
  layout = "circle",
  nonsig = "hide"
)
plot(
  mlVARstoics,
  "between",
  title = "Stoics (n=17)\nBetween-person interrelations",
  layout = "circle",
  nonsig = "hide"
)

# Run mlVAR on the data of the Non-Stoics
mlVARnonstoics <- mlVAR(
  data = nonstocis3samples,
  vars = c("Matters", "Content", "Person", "Joyful", "Sad"),
  idvar = "Study_ID",
  lags = 1
```

```
)
summary(mlVARnonstoics)
plot(
  mlVARnonstoics,
  "contemporaneous",
  title = "Non-Stoics (n=405)\nWithin-person interrelations",
  layout = "circle",
  nonsig = "hide"
)
plot(
  mlVARnonstoics,
  "temporal",
  title = "Non-Stoics (n=405)\nWithin-person lag-1\ntemporal interrelations
",
  layout = "circle",
  nonsig = "hide"
)
plot(
  mlVARnonstoics,
  "between",
  title = "Non-Stoics (n=405)\nBetween-person interrelations",
  layout = "circle",
  nonsig = "hide"
)
```