7. APPENDIX

7.1 Appendix A: Theoretical Background

Table A1
Taxonomies of Intraindividual Variability (in Chronological Order)

Authors	Types of Variability	Description/Examples
Fiske & Rice (1955)	– Spontaneous (Type I) variability	– uncorrelated responses at different time points; attributable only to within-person factors (stimulus and situational context are unchanged)
	– Reactive or systematic (Type II) variability	– same stimulus and same context assumptions are met (Type I), but in addition, each response is affected by the preceding one
	– Adaptive variability	– when either two objectively different stimuli trigger different responses or when situational context has changed from one time to the next. Focus is on (mal-)adaptive implications of response differences, (e.g., too small: indicating a possible failure to adapt; too big: indicating an overreaction)
Cattell (1957a)	– function fluctuant states	– states of traits that form a within-person factor by temporal coupling and are related to individual differences in mean levels of the corresponding trait
	– purely fluctuant states	– do not form a within-person factor related to a corresponding trait
Nesselroade (1991b, 2001)	– potentially reversible within-person changes	– Variability as fluctuation: e.g., mood
	– potentially less reversible changes	– Variability as change: e.g., learning, maturation
Li, Huxhold, & Schmiedek (2004)	– Plasticity	– Amount of gain through short-term intensive training
	– Diversity	– Decrease of functioning possibly associated with exploratory behavior and strategies during initial acquisition of complex tasks
	– Fluctuation	– Random processing fluctuation around asymptotic performance level
	– Adaptability	– Ability to alter performance following perturbations in person-task environment to achieve maximum performance again

(Table continues)

Table A1 *(continued)*

Authors	Types of Variability	Description/Examples
Lindenberger & Oertzen (2006) *(modified after Li et al., 2004)*	– Time-Scale: Microgenetic, Scope: Variations in single function	– Relatively reversible variations in single function, e.g., processing fluctuation, plasticity, within-task strategic diversity, adaptability to environmental perturbations
	– Time scale: Microgenetic, Scope: Transformations in functional organization	– Relatively reversible variations in functional organization, e.g., shifts in resource allocation, coordination, and compensatory behavior during multitasking, situational choice or preference behavior
	– Time scale: ontogenetic, Scope: Variations in single function	– Relatively permanent changes in one function, e.g., physical growth, progressive (e.g., trait) changes in any cognitive function, long-term learning and skill acquisition
	– Time scale: ontogenetic, Scope: Transformations in functional organization	– Relatively permanent alterations in functional organization, e.g., ability dedifferentiation from adulthood to old age/from childhood to early adulthood

7.2 Appendix B: Method

7.2.1 Distribution of Participants Across Testing Times

Table B1
Distribution of Young and Older Participants Across Testing Time Slots

Time of Testing	Number of Young Adults	Number of Older Adults
9–10 a. m.	4	0
10–11 a. m.	2	2
11–12 a. m.	0	5
12–13 p. m.	1	3
13–14 p. m.	1	4
14–15 p. m.	2	2
15–16 p. m.	2	1
16–17 p. m.	1	2
17–18 p. m.	1	0
18–19 p. m.	2	0
19–20 p. m.	2	0

7.2.2 German Translation of Original English Items

Table B2
Translations of Affect Items from PANAS and Circumplex Models

PANAS Positive Affect		PANAS Negative Affect	
English	*German*	*English*	*German*
active	aktiv	afraid	ängstlich
alert	hellwach	ashamed	beschämt
attentive	aufmerksam	distressed	bedrückt
determined	entschlossen	guilty	schuldig
enthusiastic	begeistert	hostile	feindselig
excited	erwartungsvoll	irritable	reizbar
inspired	angeregt	jittery	unruhig
interested	interessiert	nervous	nervös
proud	stolz	scared	verängstigt
strong	stark	upset	verärgert
Pleasantness		Unpleasantness	
English	*German*	*English*	*German*
happy	glücklich	sad	traurig
delighted/joyful	erfreut	downhearted	niedergeschlagen
content	zufrieden	frustrated	frustriert

7.2.3 *Descriptive Statistics of Central and Background/Control Variables*

Table B3
Descriptive Statistics for Central Aggregated Daily and Trait Variables (N = 37)

Construct	*M*	*SD*	*Min*	*Max*	*Skew (SE)*	*Kurt (SE)*
			Aggregated Daily Variables			
Emotional Well-Being						
Positive Affect (PANAS)	4.34	1.03	2.49	7.04	0.52 (.39)	0.22 (.76)
Negative Affect (PANAS)	1.42	0.45	1.00	2.77	1.32 (.39)	1.14 (.76)
Pleasantness	4.62	1.12	1.93	6.89	0.00 (.39)	0.02 (.76)
Unpleasantness	1.55	0.71	1.00	3.61	1.66 (.39)	2.06 (.76)
Hedonic Balance						
Cognitive Performance						
Vigilance-RT[a]	379.85	59.85	281.36	469.45	0.14 (.40)	–1.31 (.78)
Working Memory RT[a]	601.43	309.78	280.20	1625.78	1.25 (.40)	1.92 (.78)
Self-Rated Stress						
Subjective Stress Appraisal	3.27	1.01	1.18	5.11	–0.29 (.39)	–0.84 (76)
			Trait Variables			
Personality						
Extraversion	4.11	0.44	2.50	5.17	–1.04 (.39)	4.26 (.76)
Neuroticism	3.54	0.51	2.42	4.75	–0.09 (.39)	0.19 (.76)
Subjective Well-Being						
Life Satisfaction	4.65	1.00	2.60	6.80	–0.31 (.39)	–0.28 (.76)
Positive Affect (PANAS)	5.16	0.57	4.10	6.60	0.31 (.39)	–0.05 (.76)
Negative Affect (PANAS)	3.13	0.92	2.00	5.40	0.95 (.39)	0.13 (.76)
Pleasantness	5.22	1.02	2.33	6.67	–0.77 (.39)	0.33 (.76)
Unpleasantness	3.15	1.23	1.00	5.67	0.49 (.39)	–0.63 (.76)
Hedonic Balance	2.06	1.95	–2.00	5.00	–0.71 (.39)	–0.39 (.76)
Ryff Well-Being (Total)	5.31	0.64	3.74	6.59	–0.54 (.39)	–0.02 (.76)
Autonomy	4.91	0.77	2.78	6.33	–0.50 (.39)	0.31 (.76)
Environmental Mastery	5.16	1.04	2.22	7.00	–1.03 (.39)	1.26 (.76)
Personal Growth	5.57	0.71	4.33	6.89	0.25 (.39)	–1.00 (.76)
Positive Relations	5.49	0.81	3.44	6.78	–0.89 (.39)	0.61 (.76)
Life Goals	5.41	0.82	3.67	7.00	–0.12 (.39)	–0.57 (.76)
Self-Acceptance	5.31	0.98	2.89	6.67	–0.69 (.39)	–0.35 (.76)

Note. [a] $N = 35$ due to taking out one older adult who failed to learn the working memory task and one younger adult whose response latencies increased over time (i.e., did not show the expected pattern of stability or performance improvement).

Table B4

Descriptive Statistics for Background and Control Variables (N = 37)

Construct	*M*	*SD*	*Min*	*Max*	*Skew (SE)*	*Kurt (SE)*
Educational Level and Intelligence Screening						
Years of Education	13.99	4.22	4.00	21.00	–0.64 (.39)	–0.20 (.76)
Perceptual Speed: DST[a]	48.78	14.66	24.00	79.00	0.10 (.39)	–0.93 (.77)
Perceptual Speed: IP	34.50	8.47	23.00	46.00	0.03 (.39)	–0.17 (.77)
Verbal Knowledge: Vocab	24.57	4.68	10.00	32.00	–0.82 (.39)	1.28 (.76)
Verbal Knowledge: SAW	30.00	5.33	12.00	35.00	–0.21 (.39)	1.83 (.76)
Self-Rated Health and Diurnal Preferences						
Subjective Physical Health	3.59	.87	1.00	5.00	–0.72 (.39)	1.19 (.76)
Depression (CES–D Total)	10.16	6.75	1.00	28.00	1.06 (.39)	0.92 (.76)
Morningness	3.27	.81	1.69	4.62	–0.23 (.39)	–0.93 (.76)
Eveningness	3.61	.87	2.08	5.08	–0.15 (.39)	–1.06 (.76)
Achievement Orientation						
Achievement Motivation	4.76	.80	2.75	6.13	–0.62 (.39)	0.15 (.76)
Emotional Experience						
Affect Intensity	4.04	0.70	2.53	6.00	0.32 (.39)	0.94 (.76)
Self-Rated Assessment of Typicality of Testing Period						
Typicality of Testing Period[b]	4.59	1.58	1.00	7.00	–0.55 (.41)	–0.80 (.80)

Notes. DST: Digit-Symbol-Substitution-Test, IP= Identical Pictures, Vocab=WAIS Vocabulary, SAW = Spot-a-Word.

[a] N = 36, because one older adult did not understand the task instruction.

[b] N = 33 (One young and three older adults did not provide a rating).

7.2.4 *Commentaries to Whether Daily Assessment Period was Typical for Everyday Life*

Table B5
Frequencies of and Commentaries to Endorsed Ratings of Typicality of Daily Testing Period by Age Group

Age Group	Rating	*n*	Comments provided by participants
Young	1	1	no comment
	2	1	This is only because I am currently writing my thesis
	3	3	(1) I was often really tired (2) Have worked a lot and currently writing diploma thesis (3) no comment
	4	1	Through the fixed schedule my days received a clear structure
	5	3	No comments
	6	7	(1) The atmosphere and at the beginning the experimenters … (2) to (7) no comments
	7	1	No comment
	missing	1	No comment
Older	1	0	
	2	2	No comments
	3	2	No comments
	4	5	(1) Testing was part of daily routine (2) My daily routine was altered (3) & (4) no comments
	5	1	No comments
	6	6	No comments
	7	0	
	missing	3	(1) Through the study my day was torn apart, nine weeks are really long (2) My everyday life was more diverse, made more sense. (3) My everyday life was a bit strongly affected by the daily, fixed testing time

7.3 Appendix C: Results

7.3.1 Descriptives of Daily Affect and Hedonic Balance for Each Participant (N = 37)

Table C1
Descriptives of Daily Positive Affect (PANAS) for Each Participant (Scale: 1–8)

Participant	ID	Sex	*M*	*SD*	*Min*	*Max*	$N_{Sessions}$
			Young Adults				
1	11002	m	2.60	0.77	1.20	4.30	42
2	11005	m	3.92	0.75	2.80	6.80	45
3	11008	m	3.40	1.00	1.50	5.40	45
4	11011	m	4.12	0.53	2.90	5.30	45
5	11012	m	3.95	0.87	2.10	5.50	45
6	11025	m	4.54	0.77	2.70	6.30	46
7	11029	m	3.80	0.56	2.40	4.60	45
8	11032	m	4.76	0.57	3.20	6.00	45
9	11033	m	3.38	0.72	2.30	5.30	45
10	12003	f	4.34	1.07	2.10	6.50	44
11	12018	f	3.29	1.16	1.00	5.30	44
12	12021	f	4.70	0.32	3.90	5.40	45
13	12022	f	3.49	0.53	1.20	4.30	45
14	12023	f	3.66	0.60	2.40	5.80	45
15	12026	f	2.49	0.70	1.20	4.10	45
16	12030	f	3.86	0.81	1.90	5.20	45
17	12240	f	4.01	0.93	1.60	5.70	45
18	12283	f	4.29	0.86	2.30	6.50	46
			Older Adults				
1	21001	m	5.27	0.45	4.10	6.30	39
2	21006	m	5.04	0.74	3.80	6.90	43
3	21007	m	5.02	0.33	4.30	5.70	43
4	21009	m	4.12	0.57	3.00	5.30	45
5	21027	m	5.90	0.36	4.60	6.50	45
6	21034	m	4.15	0.39	3.20	5.00	45
7	21035	m	5.12	0.20	4.40	5.70	45
8	21036	m	6.16	0.14	6.00	6.50	45
9	21037	m	5.96	0.44	4.50	6.60	45
10	21285	m	4.77	0.29	4.30	5.60	45
11	22010	f	2.74	0.62	1.70	4.40	45
12	22014	f	4.00	0.56	3.00	5.30	44
13	22015	f	5.06	0.44	3.60	5.60	45
14	22019	f	7.04	0.47	6.50	7.90	45
15	22024	f	3.37	0.38	2.50	4.00	45
16	22039	f	4.22	0.33	3.30	4.90	45
17	22281	f	4.56	0.57	3.30	5.90	45
18	22282	f	3.31	0.30	2.70	3.90	45
19	22284	f	6.04	0.26	5.50	6.60	45

Table C2
Descriptives of Daily Negative Affect (PANAS) for Each Individual (Scale: 1–8)

Participant	ID	Sex	*M*	*SD*	*Min*	*Max*	*N* Sessions
			Young Adults				
1	11002	m	1.10	0.27	1.00	2.20	42
2	11005	m	2.26	0.65	1.40	4.20	45
3	11008	m	1.73	0.86	1.00	4.70	45
4	11011	m	2.19	0.32	1.60	3.00	45
5	11012	m	1.18	0.38	1.00	2.70	45
6	11025	m	1.48	0.45	1.00	3.10	46
7	11029	m	1.67	0.39	1.10	3.30	45
8	11032	m	1.90	0.38	1.10	3.00	45
9	11033	m	1.13	0.27	1.00	2.50	45
10	12003	f	1.38	0.51	1.00	4.10	44
11	12018	f	1.84	0.59	1.00	3.70	44
12	12021	f	1.33	0.29	1.00	2.30	45
13	12022	f	1.58	0.84	1.00	4.30	45
14	12023	f	1.05	0.11	1.00	1.50	45
15	12026	f	1.37	0.39	1.00	2.90	45
16	12030	f	1.63	0.47	1.00	3.20	45
17	12240	f	1.03	0.13	1.00	1.80	45
18	12283	f	1.43	0.47	1.00	2.70	46
			Older Adults				
1	21001	m	1.03	0.10	1.00	1.50	39
2	21006	m	1.08	0.17	1.00	1.70	43
3	21007	m	1.21	0.17	1.00	1.60	43
4	21009	m	1.08	0.18	1.00	1.80	45
5	21027	m	1.01	0.05	1.00	1.30	45
6	21034	m	1.02	0.09	1.00	1.60	45
7	21035	m	1.00	0.01	1.00	1.10	45
8	21036	m	1.05	0.19	1.00	2.00	45
9	21037	m	2.77	0.64	2.00	4.60	45
10	21285	m	1.10	0.17	1.00	1.90	45
11	22010	f	2.19	0.49	1.40	3.60	45
12	22014	f	1.37	0.21	1.00	2.00	44
13	22015	f	1.01	0.07	1.00	1.50	45
14	22019	f	1.15	0.13	1.00	1.70	45
15	22024	f	1.15	0.11	1.00	1.40	45
16	22039	f	1.19	0.46	1.00	3.50	45
17	22281	f	1.42	0.23	1.00	2.20	45
18	22282	f	2.27	0.24	2.00	3.50	45
19	22284	f	1.05	0.12	1.00	1.60	45

Table C3
Descriptives of Daily Hedonic Balance for Each Individual

Participant	ID	Sex	*M*	*SD*	*Min*	*Max*	$N_{Sessions}$
			Young Adults				
1	11002	m	2.87	1.59	–1.67	5.67	42
2	11005	m	2.05	1.48	–2.67	4.00	45
3	11008	m	1.59	2.49	–7.00	5.67	45
4	11011	m	0.55	1.39	–3.33	3.67	45
5	11012	m	2.90	2.24	–5.00	5.33	45
6	11025	m	3.71	2.12	–4.33	7.00	46
7	11029	m	1.71	1.22	–3.67	3.33	45
8	11032	m	3.19	1.12	0.33	5.00	45
9	11033	m	4.15	0.93	1.33	6.00	45
10	12003	f	4.94	1.75	–2.33	7.00	44
11	12018	f	1.33	1.75	–3.00	4.67	44
12	12021	f	4.04	0.93	2.00	5.67	45
13	12022	f	2.16	2.17	–6.33	4.00	45
14	12023	f	3.22	0.70	1.67	5.33	45
15	12026	f	1.51	1.68	–3.00	4.00	45
16	12030	f	3.27	1.63	–1.67	5.33	45
17	12240	f	4.05	1.73	–3.67	6.00	45
18	12283	f	3.66	1.16	0.67	6.33	46
			Older Adults				
1	21001	m	4.16	0.49	2.33	5.33	39
2	21006	m	3.71	0.81	2.33	5.33	43
3	21007	m	5.29	0.75	2.00	6.00	43
4	21009	m	3.38	0.73	0.33	4.67	45
5	21027	m	5.47	0.54	3.67	6.33	45
6	21034	m	3.62	0.45	2.67	4.33	45
7	21035	m	4.14	0.23	3.67	5.00	45
8	21036	m	5.58	0.35	5.00	6.00	45
9	21037	m	1.79	1.01	–1.00	3.33	45
10	21285	m	3.16	0.53	1.67	4.33	45
11	22010	f	–1.58	1.01	–4.33	0.33	45
12	22014	f	–0.76	0.95	–2.33	1.33	44
13	22015	f	3.44	0.48	2.33	5.00	45
14	22019	f	5.86	0.70	4.33	7.00	45
15	22024	f	2.57	0.33	1.67	3.33	45
16	22039	f	2.98	0.67	–0.67	3.67	45
17	22281	f	3.38	0.87	1.33	4.67	45
18	22282	f	1.64	0.47	0.33	2.33	45
19	22284	f	4.87	0.45	3.33	5.67	45

Notes. Hedonic Balance = Pleasantness – Unpleasantness. This score had a possible range of –7 to +7. Neutral hedonic tone is represented by a score of 0, and positive scores indicate an overall positive hedonic tone.

7.3.2 *Characteristics of Between-Person and Within-Person Variability in Daily PA and NA: Computing Between-Person Variance in an Alternative Way To Nesselroade & Salthouse (2004)*

Instead of using the (between-person) standard deviation across each individual's aggregated mean score of affect as a measure of between-person variance as proposed in Nesselroade and Salthouse (2004), I have also computed the between-person standard deviation around individual mean PA and NA scores for each session, and then used the average of those individual between-standard deviations as a measure of the average between-person variance in daily PA and daily NA. The resulting figures are outlined in Table C4.

Table C4
Characteristics of Within-Person and Between-Person Variance in Daily Positive and Negative Affect: An Alternative to Nesselroade & Salthouse (2004)

	Total	Young	Older
		Positive Affect	
Between-person variance	1.18	0.96	1.18
Within-person variance	0.58	0.75	0.41
Ratio of within- to between-person variance	0.49	0.78	0.35
		Negative Affect	
Between-person variance	0.57	0.58	0.55
Within-person variance	0.31	0.43	0.20
Ratio of within- to between-person variance	0.54	0.74	0.36

7.3.3 Results of Multilevel Modeling Analyses on Age-Related Differences in Mean Levels of Day-to-Day Hedonic Balance

Table C5
Multilevel Modeling Results of Predicting Intraindividual Mean Levels of Day-to-Day Hedonic Balance by Age Group Using Full Maximum Likelihood Estimation

	Baseline Model			*Age Group Model*		
	b	*SE*	*p*	*b*	*SE*	*p*
Fixed Effects						
Intercept (Mean Level)	3.07	0.27	< .0001	2.83	0.38	< .0001
Age group				.47	0.53	.37
Random Effects (Variance Components)						
Within-Person	1.5260	0.05	< .0001	1.5260	0.05	< .0001
Between-Person	2.5809	0.61	< .0001	2.5251	0.61	< .0001
Variance Explained[a]						
Pseudo-$R^2_{0\ \text{(Intercept)}}$		—			.02	
Goodness-of-fit						
Deviance (–2*LL*)		5543.6			5542.8	
χ^2 (*df*)[a]					0.8 (1), p = .37	

Notes. Hedonic Balance = Pleasantness score – unpleasantness score. Range of scores for daily hedonic balance: –7 to +7 (with a score of 0 indicating neutral hedonic tone and a positive and negative score indicating more positive or negative hedonic tone, respectively).

Age group was coded as young adults = 0 and older adults = 1.

[a] Variance explained, change in deviance and in model fit determined in reference to the baseline model, which does not include age group.

7.3.4 *Follow-Up Analyses on Age-Related Differences in Mean Levels of Day-to-Day Positive and Negative Affect: Separating Intensity and Frequency*

As a follow-up to the main analyses on age differences in aggregated levels of day-to-day positive and negative affect, the daily affect data was decomposed into a frequency and an intensity score for each participant (Carstensen et al., 2000; Schimmack & Diener, 1997). A frequency score was computed for each individual as the ratio of sessions on which each affect received a rating greater than 1 (i.e., indicating that the affect was being experienced at all). These ratios were subsequently averaged separately across all positive and all negative items to yield a frequency score for positive affect and a frequency score for negative affect for each individual. An intensity score for each item was computed as the average rating on each affect item across all ratings greater than 1. (Note that the overall mean score reported in the main text differs from the intensity score by averaging responses across *all* ratings, including those that equal 1). These item-based intensity scores were then averaged for all items belonging to the PA-scale and for all items belonging to the NA-scale to obtain an intensity score each for PA and for NA for every individual. The first column of Table C6 shows the zero-order correlation of the frequency and intensity scores with chronological age and the descriptives of these frequency and intensity scores separately for the young and for the older adults.

The correlational analyses indicated a significant positive correlation of $r = .48$ ($p < .01$) between the intensity of PA and age, suggesting that intensity was greater in older than younger adults. The other associations did not reach statistical significance, but together with the descriptives suggested that there was a trend for older adults to report a greater average frequency of experiencing PA ($r = .31$, $p = .07$), and lower levels of frequency, but there was no reliable difference between young and older adults in mean intensity of NA.

Table C6
Descriptives of Frequency and Intensity of Daily Positive Affect (PA) and Daily Negative Affect (NA) for Young and Older Adults and Correlation with Chronological Age

	Correlation with Age	Young Adults		Older Adults	
	r	*M*	*SD*	*M*	*SD*
Frequency of PA	$.31^{\#}$	0.89	0.12	0.96	0.11
Intensity of PA	.48**	4.08	0.46	4.91	1.01
Frequency of NA	–.23	0.28	0.20	0.18	0.29
Intensity of NA	–.04	2.78	0.54	2.82	0.97

Note. $^{\#}$ $p = .07$, ** $p < .01$.

The significance of mean level differences between the two age groups in frequency and intensity of both affect dimensions was further examined using two repeated measures analyses of variance. In the first analysis, intensity (PA vs. NA) was the within-person factor, and in the second analysis, frequency (PA vs. NA) served as the within-person factor. In both analyses, age group (young vs. old) was the between-person factor. The complete results of these analyses are presented in Tables C7 and C8.

Table C7
Results of Repeated Measures Analyses of Variance on Age Group Differences in Intensity of Daily Positive and Negative Affect

	F	*df*	*p*	η^2
Within-Person Effects				
Affect Domain	70.69	1, 35	.00	.67
Affect Domain × Age Group	3.82	1, 35	.06	.10
Between-Person Effects				
Age Group	7.01	1, 35	.01	.17
Follow-up ANOVAS				
Intensity of PA	10.15	1, 35	.00	.23
Intensity of NA	0.03	1, 35	.87	.00

Notes. PA = Positive Affect, NA = Negative Affect.

Results are reported after applying a Greenhouse-Geisser correction to the data to accommodate violation of the assumption of sphericity.

** $p < .01$, *** $p < .0001$.

Table C8
Results of Repeated Measures Analyses of Variance on Age Group Differences in Frequency of Daily Positive and Negative Affect

	F	*df*	*p*	η^2
Within-Person Effects				
Affect Domain	247.20	1, 35	.00	.88
Affect Domain × Age Group	4.09	1, 35	.05	.11
Between-Person Effects				
Age Group	0.13	1, 35	.72	.00

Notes. PA = Positive Affect, NA = Negative Affect.

Results are reported after applying a Greenhouse-Geisser correction to the data to accommodate violation of the assumption of sphericity.

** $p < .01$, *** $p < .0001$.

7.3.5 *Time-Related Trends in PA and NA: Detailed Overview of Model Coefficients*

Table C9
Results of Fitting a Sequence of Multilevel Growth Models to Day-to-Day Positive Affect

	Linear Change			Quadratic Change		
	b	*SE*	*p*	*b*	*SE*	*p*
Fixed Effects						
Initial Status, Intercept, β_0	4.54	0.17	< .0001	4.62	0.17	< .0001
Rate of Linear Change, β_1	–0.01	0.00	< .01	–0.02	0.01	< .0001
Rate of Quadratic Change, β_2				0.0003	0.00	< .05
Random Effects (Variance Components)						
Within-Person	0.3290	0.01	< .0001	0.3271	0.01	< .0001
Between-Person						
In initial status	1.0053	0.24	< .0001	1.0045	0.24	< .0001
In linear change	0.0003	0.00	< .0001	0.0003	0.00	< .0001
In quadratic change				— [a]		
Covariance (β_0, β_1)	–0.0027	0.00	.39	–0.0027	0.00	.39
Variance Explained						
Pseudo-R^2_ε		.1641			.1690	
Goodness-of-fit						
Deviance (–2*LL*)		3107.3			3098.4	
χ^2 (*df*)[b]		214.8 (3), $p < .001$			8.9 (1), $p < .01$	

Notes. Age group was coded as young = 0, old = 1. The session variable used to estimate the linear trend was centered at the first session, so that the intercept represents initial status in daily PA and NA.

[a] The quadratic term was modeled as fixed rather than random to ensure model conversion.

[b] Variance explained, change in deviance and in model fit were determined by comparing each subsequent model in the sequence to the previous one, i.e., linear change vs. no change, quadratic change vs. linear change.

* $p < .05$; ** $p < .01$; *** $p < .001$

Table C10
Results of Fitting a Sequence of Multilevel Growth Models to Day-to-Day Negative Affect

	Linear Change			Quadratic Change		
	b	*SE*	*p*	*b*	*SE*	*p*
Fixed Effects						
Initial Status, Intercept, β_0	1.47	0.09	< .0001	1.50	0.09	< .0001
Rate of Linear Change, β_1	–0.002	0.00	.19	–0.01	0.00	< .05
Rate of Quadratic Change, β_2				0.00	0.00	.07
Random Effects (Variance Components)						
Within-Person	0.1279	0.00	< .0001	0.1276	0.00	< .0001
Between-Person						
In initial status	0.2708	0.07	< .0001	0.2710	0.07	< .0001
In linear change	0.0001	0.00	< .0001	0.0001	0.00	< .0001
In quadratic change				— [a]		
Covariance (β_0, β_1)	–0.0028	0.00	< .01	–0.0028	0.00	< .01
Variance Explained						
Pseudo-R^2_ε	.1167			.1187		
Goodness-of-fit						
Deviance (–2*LL*)	1513.8			1510.4		
χ^2 (*df*)[b]	132.9 (3), $p < .0001$			3.4 (1), $p = .07$		

Notes. Age group was coded as young = 0, old = 1. The session variable used to estimate the linear trend was centered at the first session, so that the intercept represents initial status in daily PA and NA.

[a] The quadratic term was modeled as fixed rather than random to ensure model conversion.

[b] Variance explained, change in deviance and in model fit were determined by comparing each subsequent model in the sequence to the previous one, i.e., linear change vs. no change, quadratic change vs. linear change.

* $p < .05$; ** $p < .01$; *** $p < .001$

7.3.6 Random Effects Results of Multilevel Modeling Analyses on Age-Related Differences in Time-Related Trends of Day-to-Day PA and NA

Table C11

Random Effects Results and Model Fit from Multilevel Modeling Analyses of Age-Related Differences in Trajectories of Day-to-Day PA and NA Using Full Maximum Likelihood Estimation

		Positive Affect	Negative Affect
Random Effects (Variance Components)			
Within-Person	σ^2_ε	0.3289***	0.1279***
Between-Person			
In initial status	σ^2_0	0.7626***	0.2698***
In linear change	σ^2_1	0.0003***	0.0001***
Covariance	σ_{01}	–0.0031	–0.0028*
Variance explained			
Pseudo-R^2_0 (Intercept)		.2414	.0037
Pseudo-R^2_1 (Slope)		.0000	.1075
Goodness-of-fit			
Deviance (–2*LL*)		3096.1	1507.6
χ^2 (*df*)[a]			
– full age group model vs. baseline between-person model		11.2 (2), $p < .01$	6.2 (2), $p < .05$
– full age group model vs. intercept only age group model		0 (1), $p = 1.0$	3.3 (1), $p = .07$

Notes. Range of response scale for daily positive affect: 1 (not at all) to 8 (extremely).
Age group was coded as young = 0, old = 1. The session variable to estimate the linear trend was centered at the first session, so that the intercept represents the average level of affect at the first session.
[#] $p = .06$; * < .05; *** $p < .0001$

7.3.7 Day-of-the-Week Effects in PA and NA in Younger and Older Adults

For each participant and each affect domain, five scores were computed that represented the average experience of PA and NA, respectively, on each Weekday (i.e., Monday through Friday). Two repeated measures analyses of variance (ANOVA) were then conducted for each affect domain, in which age group was the between-person factor and day-of-the-week was the five-level within-person factor. Regarding PA, the within-person effect of Weekday was insignificant (F (4, 140) = 2.27, p = .064, η_p^2 = .06), and the Weekday × Age group interaction also did not reach significance (F (4, 140) = 1.29, p = .28, η_p^2 = .04). The between-person main effect of Age group was significant (F (1, 35) = 843.60, p < .0001, η_p^2 = .96), suggesting that across all days of the week, older adults' average level of PA was higher than younger adults'.

The pattern of findings regarding a day-of-the-week effect in NA was similar. Both the within-person main effect of Weekday was insignificant (F (4, 140) = 2.07, p = .09, η_p^2 = .06) as was the Time × Age group interaction (F (4, 140) = 1.18, p = .32, η_p^2 = .03). The between-person main effect of Age group was not significant (F (1, 35) = 1.71, p = .20, η_p^2 = .05), suggesting that across the days of the week, younger and older adults' mean levels of NA did not differ. In sum, the present data do not indicate any day-of-the-week effects for the domains of PA and NA, at least not with respect to the five days from Monday through Friday.

7.3.8 Age-Related Differences in Retrospective Subjective Reports of Mood Fluctuations

Table C12

Descriptives of Young and Older Adults' Retrospective Appraisals of Mood Fluctuations During Daily Assessment Phase

	Young Adults		Older Adults		Effect Size
Self-Reported Retrospective Mood Fluctuation	*M*	*SD*	*M*	*SD*	η_p^2
Fluctuation Overall	3.61	1.34	3.16	1.43	.03
Fluctuation Positive Affect	3.22	1.22	2.68	1.20	.05
Fluctuation Negative Affect	3.83	1.62	2.53	1.17	.19**

Note. ** $p < .01$

7.3.9 Age Differences in Variability in PA and NA: Using the Coefficient of Variation as an Indicator of Variability

Given that the possible range for variability is likely to be restricted at extreme (high or low) mean levels of a given variable, it is conceivable that in time-series data, intraindividual mean levels and intraindividual standard deviations tend to be correlated. In order to examine whether such a relationship was also observable in the affect data of the present study, zero-order correlations between mean intensity as an indicator of mean level of affect over time and the ISD for each affect domain were computed. Given the significant age-related differences in level of intensity of PA and in intraindividual variability in PA and NA, the correlation between level and variability was run separately for the two age groups. The only significant relationship in both age groups was between mean level of NA and variability in NA with $r_{\text{young}} = .54$ ($p < .05$) and $r_{\text{older}} = .80$ ($p < .0001$). The age-partialled correlation between intensity and variability of NA was $r_{\text{p(age)}} = .65$ ($p < .0001$). Individuals with higher levels of intensity in experiencing negative affect were also significantly more variable in their day-to-day experience of negative affect across the nine weeks. Apart from its conceptual meaning, this result likely reflects a floor effect (at too low levels of NA experience, the potential range for fluctuation is limited). The respective correlation between level and variability in PA were much smaller and non-significant ($r_{\text{young}} = -.21$, $p = .40$; $r_{\text{older}} = -.28$, $p = .25$; $r_{\text{p(age)}} = -.22$, $p = .20$). The observable trend of greater mean levels in PA being related to less variability in PA is likely due to ceiling effects that limit one's potential for day-to-day fluctuations.

In an effort to examine age-related differences in affective variability unconfounded by age-related differences in mean levels of affect, the coefficient of variation (i.e., SD of a time-series/Mean of a time-series; Wilson & Payton, 2002) was computed separately for each individual as a measure of variability that accounts for individual differences in mean level. In a repeated measures analysis of variance, the between-person effect of age group was significant. The within-person effect of affect domain was also significant, and indicated that variability as operationalized by the coefficient of variation was greater in PA than in NA, and this was the case for both young and older adults.

An examination of the between-person effect using separate follow-up ANOVAS revealed a pattern of age-related differences similar to the ones reported on the respective standard deviations alone: Young adults tended to have a significantly higher coefficient of variation in both PA (M = .20, SD = .07) and NA (M = .28, SD = .11) than older adults (PA: M = .09, SD = .05; NA: M = .14, SD = .08; $F_{PA}(1, 35) = 31.77$, $p < .0001$, $\eta_p^2 = .48$, $F_{NA}(1, 35) = 18.88$, $p < .0001$, $\eta_p^2 = .35$). Thus, even when taking into account individual and age-related differences in level of emotional experience, older adults showed significantly less day-to-day variability in both PA and NA than younger adults.

7.3.10 Intraindividual Variability in PANAS and Pleasantness/Unpleasantness Items

Table C13

Intraindividual Variability in Positive Affect and Pleasantness Items for Each Age Group

	Young Adults		Older Adults		
	Variability		Variability		
	M^a	SD	M^a	SD	Effect Size
Positive Affect Items (PANAS)					
Enthusiastic	1.20	0.40	0.61	0.20	.48***
Excited	1.25	0.30	0.64	0.29	.53***
Inspired	1.06	0.37	0.70	0.27	.24**
Determined	1.19	0.45	0.65	0.25	.38***
Interested	1.10	0.31	0.69	0.23	.38***
Strong	1.15	0.42	0.65	0.27	.35***
Alert	1.29	0.31	0.76	0.34	.42***
Attentive	1.06	0.36	0.63	0.27	.32***
Active	1.10	0.31	0.67	0.21	.41***
Proud	1.15	0.45	0.60	0.32	.35***
Pleasantness Items					
Happy	1.12	0.37	0.62	0.19	.44***
Content	1.20	0.41	0.66	0.12	.46***
Cheerful	1.16	0.34	0.62	0.21	.49***

Notes. Range of response scale for daily positive affect and pleasantness: 1 (not at all) to 8 (extremely).

Effect sizes were derived from follow-up analyses of variance, after subjecting the intraindividual SDs to a repeated measures analysis of variance, which yielded a significant between-person effect for age group ($F(1, 35) = 16.79$, $p < .001$, $\eta_p^2 = .32$). All effects were highly significant even after applying an adjusted alpha-level criterion of .01.

[a] M = Mean Intraindividual Standard Deviation

** $p < .01$, *** $p < .001$

Table C14
Intraindividual Variability in Negative Affect and Unpleasantness Items for Each Age Group

	Young Adults		Older Adults		
	Variability		Variability		
	M^a	*SD*	M^a	*SD*	Effect Size
Negative Affect Items (PANAS)					
Scared	0.29	0.22	0.21	0.28	.03
Guilty	0.53	0.33	0.09	0.18	.42***
Irritable	0.89	0.48	0.37	0.33	.30***
Afraid	0.47	0.35	0.17	0.30	.19**
Distressed	0.99	0.42	0.37	0.47	.34***
Jittery	1.01	0.39	0.66	0.48	.15*
Upset	0.88	0.40	0.32	0.32	.39***
Nervous	0.80	0.39	0.62	0.40	.05
Hostile	0.41	0.43	0.10	0.21	.18**
Ashamed	0.35	0.36	0.20	0.27	.05
Unpleasantness Items					
Sad	0.76	0.51	0.39	0.40	.15*
Downhearted	1.03	0.44	0.43	0.50	.30***
Frustrated	0.99	0.43	0.43	0.41	.32***

Notes. Range of response scale for daily negative affect and unpleasantness: 1 (not at all) to 8 (extremely). Effect sizes were derived from follow-up analyses of variance, after subjecting the intraindividual SDs to a repeated measures analysis of variance, which yielded a significant between-person effect for age group (F (1, 35) = 16.79, $p < .001$, $\eta_p^2 = .32$). Most effects were highly significant even after applying an adjusted alpha-level criterion of .01.
[a] *M* = Mean Intraindividual Standard Deviation
* $p < .05$, ** $p < .01$, *** $p < .001$

7.3.11 Week-to-Week Change in Variability of PA and NA

In order to examine week-to-week change in variability of positive and negative affect, intraindividual standard deviations (ISD) were computed on the basis of parcels of five sessions[43]. This resulted in a maximum of nine ISDs per participant (i.e., nine weeks with five sessions each). These ISDs were then subjected to multilevel individual growth modeling using SAS Proc Mixed. Given the relatively small sample size both on the within-person and the between-person level for these analyses, results should be regarded with the necessary degree of caution.

In comparison to a baseline model that assumed daily variability to be stable from week to week, both for PA and for NA, a linear change model fit the data better (PA: $\chi^2 = 22.2$, $df = 3$, $p < .0001$; NA: $\chi^2 = 19.8$, $df = 3$, $p < .0001$). The fixed effects indicated that mean daily variability for PA was .45, with an initial level of .52 during the first week. Mean variability in NA was estimated to be 0.22, with an average initial level of 0.26. All associated random effects were significant at $p < .0001$, supporting the notion that individuals differed in the amount of daily

[43] The daily assessment phase involved testing sessions each week from Monday to Friday. Even though not all participants attended all 45 sessions on a perfectly consecutive basis, the number five was selected to represent the most meaningful parceling of time in the present study.

variability. The linear slope for PA, which accounted for 10.2% of the variance in residual daily PA variability, indicated that daily variability decreased by 0.02 from week to week (or by 0.18 across the entire nine-week period; both *p*s < .001), but the associated random effect was not significant (p = .16), and estimation of the linear slope as a fixed effect did not lead to a decrease in model fit. This suggests that in this model, no reliable individual differences in change of daily variability in PA could be estimated.

The linear slope for NA, which accounted for 14.8% of the residual variance in daily NA variability, indicated that daily variability decreased by 0.01 from week to week (or by 0.09 across the entire nine-week period; both *p*s = .08), and the associated random coefficient was significant (p = .01), suggesting that there were reliable individual differences in patterns of change in daily NA variability. Furthermore, for daily variability in NA but not in PA, a quadratic change model led to a slightly improved model fit in comparison to the linear change model (χ^2 = 11.4, df = 4, p < .05), with the quadratic change component explaining only 2.7% of the variance in NA, however (and only 0.3% of the variance in PA). The estimated fixed effect for the quadratic change component was 0.21. Even though in this model, the estimated random effect was not significant (p = .32), estimation of the quadratic change component as fixed led to a reliable reduction in model fit (χ^2 = 9.3, df = 3, p < .05). Thus, the average change trajectory of daily variability in NA is one of a slight decrease, with a small tendency for slowing of this decrease, and individuals differed in both the pattern of decrease and of slowing in decrease.

Given the hypothesis about age-related differences in variability of affect, subsequent models examined whether in addition to age-related differences in average levels of variability, the two age groups would also differ in the extent to which their daily variability exhibited change across the nine-week period. Because the quadratic change model only explained very little variance in affect variability, for these analyses, the linear change model was used as a baseline model to examine age-related differences. For PA, a model including age group as a predictor of individual differences in level of variability fit the data much better than the baseline linear change model (χ^2 = 30.1, df = 1, p < .0001)[44]. For NA, a model including age group as a between-person level predictor of both the intercept and the linear slope component also fit the data significantly better than the baseline model without age group (χ^2 = 21.4, df = 2, p < .0001).

Consistent with the findings reported in Section 4.1.4, *average* level of variability in PA across the entire nine-week period was estimated to be 0.63 for younger adults, and 0.36 lower for older adults (p < .0001), with age group explaining 61.0% of the individual difference variance in level of variability of PA (*initial* level of variability in PA was estimated to be 0.71 for younger and 0.36 lower for older adults, with age group explaining 61.0% of the individual difference variance). Likewise, the *average* level of variability in NA across the nine-week period was estimated to be 0.33 in younger adults, and to be reduced by 0.21 for older adults (p < .0001), with age group explaining 50.1% of the individual difference variance in average levels of NA variability (*initial* level of variability in NA was estimated to be 0.33 in younger adults and to be reduced by 0.13 for older adults, with age group explaining 18.4% of the individual difference variance in initial levels of NA variability). In addition, after controlling for age-related differences in the linear change component for variability in NA, the slope for young adults was almost zero (i.e., –0.0009, p = .99), whereas it was estimated to be –0.18 for older adults (p = .07), suggesting that older adults' variability in NA decreased much stronger than younger adults'. Pseudo-R^2 statistics indicated that age group explained 14.5% in the residual individual difference variance in this linear change component of variability in NA.[45]

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[44] Due to the lack of significant random effects and the fact, that estimation of the linear slope as fixed did not decrease model fit, no age-related differences in the linear slopes could be modeled for variability in PA.

[45] Follow-up analyses indicated that age group did not moderate the quadratic change component for variability in NA (p = .25).

7.3.12 Hierarchical Regression Analyses for the Prediction of Variability in Positive and Negative Affect

Table C15
Intercorrelation of Variables Used in Main and Follow-Up Analyses to Predict Variability in PA and NA

	2	3	4	5	6	7	8
1. Age group	.06	–.37*	–.17	.50**	–.22	–.36*	–.03
2. Extraversion	–	.26	.42**	–.07	.11	–.19	.31
3. Neuroticism		–	.24	–.29	.44**	.23	–.12
4. Affect Intensity			–	–.03	–.13	–.22	.21
5. Mean Level PA				–	–.22	–.23	–.19
6. Mean Level NA					–	.23	–.01
7. Years of Education						–	.16
8. Gender							–

Table C16
Results of Hierarchical Multiple Regression Predicting Variability in Positive and Negative Affect (after Controlling for Gender, Education, Mean Levels of Daily Affect and Trait Affect Intensity)

		Variability in Positive Affect		Variability in Negative Affect	
Step	Predictors	β	ΔR^2	β	ΔR^2
	Years of Education	–.13	.38**	.04	.55***
	Gender	.14		.08	
	Aggregated Daily Affect[a]	–.14		.59***	
	Affect Intensity	.22#		.33*	
2	Extraversion	–.21	.05	–.17	.04
	Neuroticism	.45*		.39#	
3	Age Group	–.62***	.25***	–.33*	.10**
4	Extraversion × Age Group	.21	.06#	–.39#	.04
	Neuroticism × Age Group	–.40*		.03	
	Overall explained variance				
	Total R^2		.74		.72
	Adjusted R^2		.65		.63

Notes. Age group was coded as young = 0 and older adults = 1.
Variability = *M*(ABS) Residuals.
Coefficients presented are from final step in the analysis. Interactions based on grand-mean centered variables.
[a] In the model predicting variability in PA, aggregated daily PA was entered. In the model predicting variability in NA, aggregated daily NA was entered.
# $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

7.3.13 *Follow-up on Sequence of Multilevel Modeling Analyses to Examine Age-Related Differences in the Coupling of Daily PA, Daily NA, and Daily Hedonic Balance With Daily Stress and Events*

Models Predicting Daily Positive Affect

Table C17
Sequence of Multilevel Models Predicting Daily Positive Affect With Daily Stress and Events

Model	Equations	–2LL	χ^2 (*df*)	*p*
A	γ_{ij} (PA)= β_{0j} + β_{1j} (Session) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + u_{0j}$	3107.3	—	—
B_1	γ_{ij} (PA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + u_{0j}$	3015.3	92 (4)	.00
B_2	Assuming no covariance of the stress-slope with the intercept and the session slope	3016.0	.07 (2)	.70
C_1	γ_{ij} (PA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + u_{0j}$	2988.8	27.2 (4)	.00
C_2	Assuming no covariance of the positive event-slope with the intercept and the other slopes	2992.0	3.2 (2)	.20
D_1	γ_{ij} (PA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + u_{0j}$ $\beta_{4j} = \gamma_{40} + u_{0j}$	2930.8	61.2 (4)	.00
D_2	Assuming no covariance of the negative event slope with the intercept and the other slopes	2936.2	5.4 (2)	.07

Note. The within-person linear change model was used as baseline model for comparison of model fit for models including stress and event variables.

Table C18
Sequence of Multilevel Models Examining Age Group Differences in Level and Coupling of Daily PA With Daily Stress and Events

Model	Equations	–2LL	$\chi^2(df)$	p
E[a]	γ_{ij} (PA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Age Group) + u_{0j} $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + u_{0j}$ $\beta_{4j} = \gamma_{40} + u_{0j}$	2925.1	11.1 (1)	.00
F	γ_{ij} (PA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Age Group) + u_{0j} $\beta_{1j} = \gamma_{10} + \gamma_{11}$ (Age Group) + u_{0j} $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + u_{0j}$ $\beta_{4j} = \gamma_{40} + u_{0j}$	2925.0	0.1 (1)	.75
G	γ_{ij} (PA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + r_{ij} $\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Age Group) + u_{0j} $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + \gamma_{21}$ (Age Group) + u_{0j} $\beta_{3j} = \gamma_{30} + u_{0j}$ $\beta_{4j} = \gamma_{40} + u_{0j}$	2924.2	0.9 (1)	.34
H	γ_{ij} (PA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Age Group) + u_{0j} $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + \gamma_{31}$ (Age Group) + u_{0j} $\beta_{4j} = \gamma_{40} + u_{0j}$	2921.8	3.3 (1)	.07
I	γ_{ij} (PA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + r_{ij} $\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Age Group) + u_{0j} $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + \gamma_{31}$ (Age Group) + u_{0j} $\beta_{4j} = \gamma_{40} + \gamma_{41}$ (Age Group) + u_{0j}	2910.7	11.1 (1)	.00

Note. [a] The baseline model for comparison of model fit for models including age group as level 2 predictors is Model D_2 from Table C17.

Table C19

Random Effect Results from Multilevel Models Predicting Daily Positive Affect by Daily Stress and Events in Total Sample and in Age Group Differences Model

Random Effects and Model Fit		Simple Within-Person Model	Age Group Differences Model
Variance Components			
Within-Person	σ^2_ε	0.2836***	0.2833***
Between-Person			
In initial status	σ^2_0	0.8716***	0.6698***
In linear change	σ^2_1	0.0003***	0.0003***
In stress slope	σ^2_2	0.0140**	0.0138**
In positive event slope	σ^2_3	$0.0355^{\#}$	0.0272
In negative event slope	σ^2_4	0.0759*	0.0311
Covariance	σ_{01}	–0.0011	–0.0017
Covariance	σ_{04}	0.1488*	0.0561
Covariance	σ_{14}	0.0002	0.0003
Variance Explained			
Pseudo-R^2_ε (stress)		.077	.016
Pseudo-R^2_ε (positive event)		.026	.331
Pseudo-R^2_ε (negative event)		.048	.590
Goodness-of-Fit			
Deviance (–2*LL*)		2930.8	2909.1

Notes. Pseudo-R^2 statistics were derived from comparing the residual within-person variance in NA in a model including all three daily covariates to three separate models lacking either one of the three predictors.

$p = .06$; * $p < .05$; ** $p < .01$; *** $p < .001$

Models Predicting Daily Negative Affect

Table C20
Sequence of Multilevel Models Predicting Daily Negative Affect With Daily Stress and Events

Model	Equations	–2LL	χ^2 (*df*)	*p*
A	γ_{ij} (NA)= β_{0j} + β_{1j} (Session) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + u_{0j}$	1513.8	—	—
B_1	γ_{ij} (NA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + u_{0j}$	1398.4	115.4 (4)	.00
B_2	Assuming no covariance of the stress slope with the intercept and the linear slope	1407.6	9.2 (2)	.01
C_1	γ_{ij} (NA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Positive Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + u_{0j}$	1394.3	4.1 (4)	.39
C_2	Assuming no covariance of positive event slope with intercept and other slopes	1397.0	1.4 (2)	.50
D_1	γ_{ij} (NA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + u_{0j}$	1194.3	202.7 (4)	.00
D_2	Assuming no covariance of the negative event slope with the intercept and the other slopes	1197.9	3.6 (2)	.17

Note. The within-person linear change model was used as baseline model for comparison of model fit for models including stress and event variables.

Table C21

Sequence of Multilevel Models Examining Age Group Differences in Level and Coupling of Daily Negative Affect With Daily Stress and Events

Model	Equations	–2LL	χ^2 (*df*)	*p*
E[a]	γ_{ij} (NA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Age Group) + u_{0j} $\beta_{1j} = \gamma_{10} + u_{0j}$ $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + u_{0j}$ $\beta_{4j} = \gamma_{40} + u_{0j}$	1197.5	.04 (1)	.53
F	γ_{ij} (NA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + \gamma_{11}$ (Age Group) + u_{0j} $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + u_{0j}$ $\beta_{4j} = \gamma_{40} + u_{0j}$	1195.1	2.8 (1)	.09
G	γ_{ij} (NA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + \gamma_{11}$ (Age Group) + u_{0j} $\beta_{2j} = \gamma_{20} + \gamma_{21}$ (Age Group) + u_{0j} $\beta_{3j} = \gamma_{30} + u_{0j}$ $\beta_{4j} = \gamma_{40} + u_{0j}$	1192.9	2.2 (1)	.14
H	γ_{ij} (NA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + \gamma_{11}$ (Age Group) + u_{0j} $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + \gamma_{31}$ (Age Group) + u_{0j} $\beta_{4j} = \gamma_{40} + u_{0j}$	1192.1	3 (1)	.08
I	γ_{ij} (NA)= β_{0j} + β_{1j} (Session) + β_{2j} (Stress) + β_{3j} (Pos. Event) + β_{4j} (Neg. Event) + $r_{ij,}$ $\beta_{0j} = \gamma_{00} + u_{0j}$ $\beta_{1j} = \gamma_{10} + \gamma_{11}$ (Age Group) + u_{0j} $\beta_{2j} = \gamma_{20} + u_{0j}$ $\beta_{3j} = \gamma_{30} + u_{0j}$ $\beta_{4j} = \gamma_{40} + \gamma_{41}$ (Age Group) + u_{0j}	1193.6	1.5 (1)	.22

Note. [a] The baseline model for comparison of model fit for models including age group as level 2 predictors is Model D_2 from Table C20.

Table C22
Random Effect Results from Multilevel Models Predicting Daily Negative Affect by Daily Stress and Events in Total Sample and in Age Group Differences Model

Random Effects and Model Fit		Simple Within-Person Model	Age Group Differences Model
Variance Components			
Within-Person	σ^2_ε	0.0992***	0.0991***
Between-Person			
In initial status	σ^2_0	0.2358***	0.2385***[a]
In linear change	σ^2_1	0.0001***	0.0001***
In stress slope	σ^2_2	0.0060**	0.0055**
In positive event slope	σ^2_3	0.0000[a]	0.0000[a]
In negative event slope	σ^2_4	0.1608***	0.1492***
Covariance (intercept, linear trend)	σ_{01}	–0.0020*	–0.0021*
Covariance (intercept, stress)	σ_{02}	0.0201*	0.0196*
Variance Explained			
Pseudo-R^2_ε (stress)		.080	—[b]
Pseudo-R^2_ε (positive event)		.000	—[b]
Pseudo-R^2_ε (negative event)		.145	—[b]
Goodness-of-Fit			
Deviance (–2*LL*)		1197.9	1188.7

Notes. Pseudo-R^2 statistics were derived from comparing the residual within-person variance in NA in a model including all three daily covariates to three separate models lacking either one of the three predictors.

[a] The random effect was estimated to be zero. Estimation of random effects may be difficult in samples with a small *N* of Level 2-units (i.e., in this study, persons; Singer & Willett, 2003).

[b] Age group did not lead to an increase in model fit for any of the within-person coupling effects. It did, in the contrary, even lead to an overall increase in some of the residual between-person variance, indicating that indeed, age group as a moderator did not capture individual differences in coupling in the daily NA data. According to Singer and Willett (2003), in such cases, pseudo-R^2 statistics should not be interpreted.

[#] $p = .06$; * $p < .05$; ** $p < .01$; *** $p < .001$

Fixed Effect Results for the Prediction of Daily Hedonic Balance

Table C23
Results from Multilevel Model on Coupling and Age-Related Differences in the Coupling of Daily Hedonic Balance with Daily Stress and Events

Fixed Effects for Coupling Analyses		Within-Person Coupling Model	Age Differences in Coupling Model
Daily Stress Slope, β_2	γ_{20}	–0.15***	–0.18**
Age Group × Stress	γ_{21}		0.07
Daily Positive Event Slope, β_3	γ_{30}	0.51***	0.74***
Age Group × Positive Event	γ_{31}		–0.53**
Daily Negative Event Slope, β_4	γ_{40}	–1.28***	–1.90***
Age Group × Negative Event	γ_{41}		1.31**

Notes. Age group was coded as young = 0, old = 1. Daily stress was group-mean centered (response scale ranged from 1 to 7). Daily events were coded as No event = 0 and Event = 1.

Hedonic Balance = Pleasantness – Unpleasantness (score range: –7 to +7, with 0 representing neutral hedonic tone).

In both models, the linear trend in the daily hedonic balance data was accounted for (and accounting for a quadratic trend led to almost identical results).

Unique variance components explained by each within-person predictor over and above the two others (pseudo-R^2) were .057 for stress, .024 for positive events, and .193 for negative events. Leaving out one of the three daily predictors from a model including all led to significant decreases in model fit for stress (χ^2 = 85.4, df = 6, p < .0001), positive event (χ^2 = 39.0, df = 6, p < .0001), and negative event (χ^2 = 226.4, df = 6, p < .0001). Pseudo-R^2 coefficients for the moderating age effects could not be computed for these models.

$^{\#}$ p < .10, * p < .05, ** p < .01, *** p < .001

7.3.14 Results of Fitting a Sequence of Individual Growth Models to Daily Vigilance RT Data

Table C24
Results of Multilevel Modeling Analyses Estimating Learning in the Daily Vigilance Performance

		Reaction Time for Hits (Vigilance Task)		
		Model A: No Change	*Model B: Linear Change*	*Model C: Quadratic Change*
Fixed Effects				
Initial Status, Intercept, β_0	γ_{00}	379.84***	418.44***	437.15***
Rate of Linear Change, β_1	γ_{10}		–1.72***[a]	–4.18***
Rate of Quadratic Change, β_2	γ_{20}			0.06***
Random Effects				
Within-Person	σ^2_ε	1281.71***	564.37***	498.51***
Between-Person				
In initial status	σ^2_0	3458.05***	4613.31***	4683.85***
In linear change	σ^2_1		1.49***	1.55***
In quadratic change	σ^2_2		—[b]	—[b]
Covariance	σ_{01}		–41.47*	–43.39**
Variance Explained				
Pseudo-R^2_ε			.56	
Goodness-of-fit				
Deviance (–2*LL*)		15437.7	14316.5	14136.9
χ^2 (*df*)		—	1121.2 (3), $p < .0001$	179.6 (1) $p < .0001$

Notes. $N = 35$

[a] In a model with a rescaled session variable, the total change across the nine-week period was estimated to be –77.31 ms.

[b] The quadratic term was modeled as a fixed effect to assure model conversion. A cubic trend model fit the data significantly better than the quadratic model ($\chi^2 = 16.1$, $df = 2$, $p < .001$), but inspection of the pseudo-R^2 statistic indicated that the cubic trend only accounted for an additional 1% of the daily vigilance RT data.

* $p < .05$; ** $p < .01$; *** $p < .001$.

7.3.15 Affect-Cognition Coupling Models with Hedonic Balance as Predictor

Table C25

Results of Multilevel Modeling Analyses Estimating the Coupling of Daily Hedonic Balance with Daily Reaction Time Performance in Working Memory

	Within-Person Coupling Model	
	Predicting Daily Vigilance RT	Predicting Daily Working Memory RT
Fixed Effects		
Daily Hedonic Balance (HB)	–0.89	–3.20
Random Effects (Variance Components)		
Within-Person	556.01***	3670.02***
Between-Person		
In daily HB slope	7.05#	229.54**
Variance Explained		
Pseudo-R^2_ε	.015	.046
Goodness-of-fit		
Deviance (–2*LL*)	14304.9	17244.2
χ^2 *(df)*: HB as random effect	11.6 (4), $p < .05$[a]	23.8 (1), $p < .0001$[b]

Notes. HB = Hedonic Balance (pleasantness – unpleasantness; scale range = –7 to + 7, with zero representing hedonic neutrality and more positive scores representing a positive hedonic balance).

Time-related trends in the data were controlled for in the coupling models shown.

Only the coefficients relevant for the central research question are shown in this table.

[a] Comparison of model fit and variance explained was determined in relation to the simple linear change model.

[b] Comparison of model fit and variance explained was determined in relation to the simple exponential change model, which also included daily hedonic balance as a fixed effect. This first coupling model led to an increase in model fit as compared to the baseline non-coupling model ($\chi^2 = 4.1$, $df = 1$, $p < .05$).

# $p < .10$, ** $p < .01$

Table C26

Fixed Effect Results and Fit of Multilevel Modeling Analyses Estimating Individual Differences in the Coupling of Daily Hedonic Balance with Daily Reaction Time Performance in Working Memory

	Individual Differences in Coupling Model	
	Predicting Daily Vigilance RT	Predicting Daily Working Memory RT
Central Individual Difference Covariate of Within-Person Coupling		
Fixed Effects		
Daily HB	–1.22	–1.69
Daily HB × Age Group	1.13	–4.02
Model Fit and Variance Explained		
χ^2 *(df)*	0.4 (1), p = .53	0.4 (1), p = .53
Pseudo-R^2_{Coupling} (by Age Group)	.057	.047
Additional Individual Difference Covariates of Within-Person Coupling		
Fixed Effects		
Daily HB	–1.04	–4.59
Daily HB × Mean Daily RT	–0.62	–0.02*
Model Fit and Variance Explained		
χ^2 *(df)*	1.2 (1), p =.27	4.5 (1), p <.05
Pseudo-R^2_{Coupling} (by Mean RT)	.000	.320
Fixed Effects		
Daily HB	–0.89	–3.16
Daily HB × Extraversion	–2.43*	–8.80
Model Fit and Variance Explained		
χ^2 *(df)*	3.8 (1), p = .05	1.9 (1), p = .17
Pseudo-R^2_{Coupling} (by Extraversion)	.076	.062
Fixed Effects		
Daily HB	–0.82	–2.34
Daily HB × Neuroticism	–0.38	–10.05**
Model Fit and Variance Explained		
χ^2 *(df)*	0.1 (1), p = .75	2.5 (1), p = .11
Pseudo-R^2_{Coupling} (by Neuroticism)	— [a]	.094

Notes. HB = Hedonic Balance (pleasantness – unpleasantness; scale range = –7 to + 7, with zero representing hedonic neutrality and more positive scores representing a positive hedonic balance).

Age group was coded as young = 0 and older = 1. All other between-person predictors were grand-mean centered.

Comparison of model fit and variance explained was determined in relation to the exponential change model that was controlled for a moderating effect of the between-person variable on the intercept only to examine whether its moderating effect on the coupling led to an additional model fit improvement. In the model shown, the exponential trend was controlled.

Only the coefficients relevant for the central research question are shown in this table.

[a] No reduction in residual variance.

* p < .05; ** p < .01