

Supplemental Materials for:

**Falling Hard, but Recovering Resoundingly:
Age Differences in Stressor Reactivity and Recovery**

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Data for this work are available via the Open Science Framework (OSF) and can be
found at: https://osf.io/8ya2w/?view_only=0887eb3baee348d4afae4196a29a9962

Method

Materials

Positive and negative affect. To demonstrate that our older and younger adult samples were characteristic in terms of their positive and negative affect, we measured affect over the past week using the Modified Differential Emotion Scale (mDES; Fredrickson et al., 2003). This 20-item scale measures how much participants felt 12 positive emotion triads (amusement, awe, compassion, contentment, gratitude, hope, interest, joy, love, pride, surprise, flirtatious) and 8 negative emotion triads (anger, contempt, disgust, embarrassment, fear, guilt, sadness, shame) during the past week. Participants responded to each item on a 5-point scale (0 = *Not at all*, 4 = *Extremely*). Responses to positive and negative items were averaged to create positive ($\alpha = .88$) and negative ($\alpha = .83$) affect subscales, with higher scores indicating greater levels of positive and negative affect. In line with past research (Carstensen et al., 2000, 2011; Charles et al., 2001; Mroczek & Kolarz, 1998), older adults reported less negative affect during the past week compared to younger adults, but similar levels of positive affect.

Cognitive battery. Participants completed a cognitive battery that involved three different tasks assessing fluid intelligence (i.e., speed of processing and working memory) and crystallized intelligence (i.e., vocabulary). To measure *speed of processing*, participants completed the Letter Comparison task (Salthouse & Babcock, 1991). Participants were presented with two strings of letters and were instructed to indicate whether the string of letters were the same or different. Participants completed five practice trials and received accuracy feedback. After that, participants had 30 seconds to compare 21 sets of letters and indicate whether they were the same or

different. The total number of trials participants answered correctly were summed. To measure *working memory*, participants completed a forward and backward digit span task (Wechsler Adult Intelligence Scale 4th ed.; Wechsler, Coalson, & Raiford, 2008). For this task, participants were presented with a sequence of numbers, with each number being presented individually for one second. For the forward task, participants were instructed to enter the numbers as they appeared to them. For the backward task, participants were instructed to enter the numbers in backwards order. Participants completed two practice trials for both the forward and backward task. The total number of trials participants answered correctly were summed. To measure vocabulary, participants completed the Shipley Vocabulary test (Shipley, 1986). Participants were presented with a word and were instructed to select one word from a list of four words that most closely matched the word in all caps. There were 40 items total. The total number of words answered correctly were summed.

Procedure

After providing informed consent, participants were presented with a tutorial video about how to interact with the interactive recovery video that would be used later in the experiment. The practice video was a different neutral office scene than the one used for the recovery period. Within the tutorial video, an experimenter demonstrated how to move around within the interactive video. Participants were then allotted 20 seconds to practice interacting with the video before moving on. Participants also completed two comprehension checks regarding how to interact with the video (see above). After the tutorial video, participants completed a measure of positive and negative affect during the past week using the Modified Differential Emotion Scale

(mDES; Fredrickson et al., 2003; see above) as a descriptive measure to characterize the sample. Next, participants completed the first set of emotion probes. After that, participants completed the anagram task. There was an example anagram that explained how to answer each anagram. After the comprehension check, participants completed five practice anagrams (four easy difficulty, one medium difficulty). Participants only received correct/incorrect feedback for the practice anagrams; they did not receive feedback regarding the percentage of participants who answered that anagram correctly. Once the practice anagrams were completed, participants were notified that they were moving on to the real anagrams. Participants completed the 30 anagrams, and then completed a second set of emotion probes. Next, participants watched the interactive recovery video and completed two sets of emotion probes within the recovery period. After the three-minute recovery period, participants completed the final set of emotion probes. Participants then completed the thought content questionnaire, cognitive battery (see above), other coping/emotion regulation measures (for unrelated purposes), and provided demographic information. Finally, participants were debriefed and thanked for their participation.

Results

Age Differences in Anagram Accuracy

Because we anticipated age (but not recovery context) differences in anagram accuracy, total anagram accuracy scores were submitted to an independent samples *t*-test. Younger adults ($M = 8.82$, $SD = 3.92$, range: 1-20) accurately answered more anagrams than did older adults ($M = 5.34$, $SD = 4.04$, range: 0-18), $t(168) = -5.70$, $p < .001$, Cohen's $d = -0.87$.

Age and Recovery Context Differences in Thought Content

Positive thoughts about the anagram task. Older ($M = 2.19$, $SD = 0.74$) and younger adults ($M = 2.33$, $SD = 0.84$) did not significantly differ in their positive thoughts about the anagram task, $p = .254$. In addition, participants in the positive ($M = .2.24$, $SD = 0.83$) and neutral ($M = 2.28$, $SD = 0.76$) recovery contexts did not significantly differ in their positive thoughts about the anagram task, $p = .762$. The interaction was not significant ($p = .683$).

Negative thoughts about the anagram task. Older ($M = 3.27$, $SD = 1.18$) and younger adults ($M = 3.15$, $SD = 1.07$) did not significantly differ in their negative thoughts about the anagram task, $p = .474$. Participants in the positive ($M = 3.25$, $SD = 1.10$) and neutral ($M = 3.16$, $SD = 1.15$) recovery contexts did not significantly differ in their negative thoughts about the anagram task, $p = .607$. The interaction was not significant, $p = .947$.

Positive thoughts about the recovery video. Older ($M = 2.78$, $SD = 0.96$) and younger adults ($M = 2.76$, $SD = 1.10$) did not significantly differ in the positive thoughts about the recovery video, $p = .931$. Participants in the positive recovery context ($M = 3.32$, $SD = 0.83$) did report greater positive thoughts about the recovery video than participants in the neutral recovery context ($M = 2.25$, $SD = 0.92$), $F(1, 166) = 62.96$, $p < .001$, $\eta_p^2 = .275$. The interaction was not significant, $p = .841$.

Negative thoughts about the recovery video. Older adults ($M = 2.47$, $SD = 1.07$) reported significantly fewer negative thoughts about the recovery video than younger adults ($M = 2.99$, $SD = 1.12$), $F(1, 166) = 10.87$, $p = .001$, $\eta_p^2 = .061$. Participants in the positive recovery context ($M = 2.36$, $SD = 1.02$) reported significantly

fewer negative thoughts about the recovery video than participants in the neutral recovery context ($M = 3.11$, $SD = 1.10$), $F(1, 166) = 22.50$, $p < .001$, $\eta_p^2 = .119$. The interaction was not significant, $p = .871$.

Other. Older adults ($M = 2.44$, $SD = 0.93$) reported fewer other thoughts than did younger adults ($M = 3.37$, $SD = 0.86$), $F(1, 166) = 44.90$, $p < .001$, $\eta_p^2 = .213$.

Participants in the positive ($M = 2.93$, $SD = 0.97$) and neutral ($M = 2.87$, $SD = 1.04$) recovery contexts did not significantly differ in other thoughts, $p = .639$. The interaction was not significant, $p = .972$.

Table S1.

Anagram Task Information

Difficulty Level	Anagram	Correct Answer	Percentage Feedback
Easy	W L R O D	world	78%
	D N O U W	wound	85%
	C H I D L	child	88%
	B C H U N	bunch	93%
	T C O U N	count	88%
	K I C R B	brick	81%
	I N B R K	brink	95%
Medium	I O G L C	logic	90%
	W S H L A	shawl	87%
	K A S N C	snack	79%
	H E C P R	perch	94%
	I T R U F	fruit	77%
	C B I N A	cabin	94%
	E M C Y R	mercy	95%
	Y A O R V	ovary	80%
Hard	M D N O E	demon	91%
	L A E N K	ankle	75%
	P O M I U	opium	92%
	O A N R P	apron	81%
	O I U M D	odium	78%
	U N I P T	input	75%
	B O T I R	orbit	74%
Impossible	L A G S E	-	72%
	N A I T M	-	82%
	H R O N A	-	91%
	S I C L A	-	90%
	A N O D U	-	80%
	A L U N O	-	88%
	O A E F R	-	71%
	O P I E R	-	86%

Note. Each anagram was presented with a number corresponding to each letter (e.g., W L R O D – 1 2 3 4 5; see Figure 1 for example). To answer the anagram, participants were instructed to report the numbers (e.g., 14325) rather than the actual word (e.g., world). Percentage feedback for how many participants answered that anagram accurately was arbitrarily determined by the research team.

Table S2.

Results for Models Referent to Baseline for Pleasant Emotion Probes

Model Effects	Estimate	SE	df	t	p
<i>Base Model</i>					
Intercept	67.17	2.03	344.09	33.05	<.001***
Stress Magnitude Change	-33.04	1.81	676.00	-18.25	<.001***
Recovery Magnitude Change	-9.46	1.81	676.00	-5.23	<.001***
Linear Slope during Recovery	1.48	0.91	676.00	1.64	.102
Quadratic Slope during Recovery	-1.49	1.57	676.00	-0.95	.341
<i>Omnibus Model</i>					
Intercept	62.50	3.46	330.07	18.06	<.001***
Stress Magnitude Change	-24.71	3.02	671.00	-8.17	<.001***
Recovery Magnitude Change	-14.95	2.47	671.00	-6.06	<.001***
Linear Slope during Recovery	-1.34	1.51	671.00	-0.89	.376
Age Group	9.42	3.98	330.07	2.37	.019*
Recovery Context	-0.09	3.98	330.07	-0.02	.983
Stress Magnitude Change $\times$ Age Group	-13.79	3.48	671.00	-3.97	<.001***
Recovery Magnitude Change $\times$ Age Group	-3.64	2.84	671.00	-1.28	.200
Linear Slope during Recovery $\times$ Age Group	3.91	1.74	671.00	2.25	.025*
Stress Magnitude Change $\times$ Recovery Context	-2.82	3.48	671.00	-0.81	.417
Recovery Magnitude Change $\times$ Recovery Context	12.47	2.84	671.00	4.39	<.001***
Linear Slope during Recovery $\times$ Recovery Context	1.72	1.74	671.00	0.99	.323

Note. Model summary results for the base model and the omnibus model for pleasant emotion probes are displayed above. We first fit a series of dummy-coded variables that corresponded to our theorized patterns in the data in the base model. *Stress magnitude change* reflects the degree of emotion change from right after the stressor compared to baseline (i.e., before the stressor). *Recovery magnitude change* reflects the degree of emotion change during the recovery period on average compared to baseline. *Linear slope during recovery* (centered to the middle of the period) reflects the slope of emotion change during the recovery period. *Quadratic slope during recovery* (also centered to the middle of the period) reflects the quadratic curve of emotion change during the recovery period. For the omnibus model, we next added *recovery context* and *age group* at Level 2 of the model predicting each of the Level 1 intercepts and slopes. Recovery context was dummy coded as 1 (positive) and -1 (neutral). Age group was dummy coded as 1 (older adults) and -1 (younger adults). We estimated models with recovery context and age group and the interaction terms with stress reactivity and recovery at Level 2. Neither the quadratic effects nor the three-way interactions were significant. We therefore re-estimated the model and removed the quadratic effects and three-way interactions term to retain the simpler model, which are reported above.

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

Table S3.

Results for Model Referent to Stress Magnitude Change for Pleasant Emotion Probes

Model Effects	Estimate	SE	df	t	p
Intercept	48.42	3.84	209.56	12.61	<.001***
Linear Slope during Recovery	2.39	0.92	504.00	2.51	.009**
Quadratic Slope during Recovery	-3.37	1.03	504.00	-3.27	.001**
Age Group	5.63	5.33	194.50	1.06	.292
Recovery Context	14.19	5.30	194.85	2.68	.008**
Linear Slope during Recovery x Age Group	4.61	1.06	504.00	4.34	<.001***
Quadratic Slope during Recovery x Age Group	-0.46	1.19	504.00	-0.39	.697
Linear Slope during Recovery x Recovery Context	5.28	1.06	504.00	4.98	<.001***
Quadratic Slope during Recovery x Recovery Context	-3.07	1.19	504.00	-2.59	.009**
Age Group x Recovery Context	-3.58	7.20	166.00	-0.51	.620

Note. Model summary results for model reference to stress magnitude change (rather than referent to baseline as in Table S2) for pleasant emotion probes. In this model, we assessed linear and quadratic slopes starting from the stressor period to the recovery period (excluding baseline data points). This allowed us to examine the extent to which individuals recovered from the stress period to the recovery period not relative to age differences at baseline.

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

Table S4.

Results for Models Referent to Baseline for Unpleasant Emotion Probes

Model Effects	Estimate	SE	df	t	p
<i>Base Model</i>					
Intercept	22.02	2.13	376.79	10.34	< .001***
Stress Magnitude Change	33.48	2.00	676.00	16.71	< .001***
Recovery Magnitude Change	11.62	2.00	676.00	5.80	< .001***
Linear Slope during Recovery	0.19	1.08	676.00	0.19	.849
Quadratic Slope during Recovery	0.44	1.73	676.00	0.25	.801
<i>Omnibus Model</i>					
Intercept	30.64	3.59	363.71	8.54	< .001***
Stress Magnitude Change	20.91	3.33	671.00	6.27	< .001***
Recovery Magnitude Change	14.07	2.72	671.00	5.17	< .001***
Linear Slope during Recovery	3.46	1.67	671.00	2.08	.038*
Age Group	-16.84	4.13	363.71	-4.08	< .001***
Recovery Context	-0.41	4.13	363.71	-0.10	.921
Stress Magnitude Change x Age Group	18.15	3.83	671.00	4.74	< .001***
Recovery Magnitude Change x Age Group	7.18	3.13	671.00	2.31	.023*
Linear Slope during Recovery x Age Group	-3.50	1.92	671.00	-1.83	.068
Stress Magnitude Change x Recovery Context	6.92	3.83	671.00	1.81	.071
Recovery Magnitude Change x Recovery Context	-11.38	3.13	671.00	-3.64	< .001***
Linear Slope during Recovery x Recovery Context	-3.01	1.92	671.00	-1.57	.117

Note. Model summary results for the base model and the omnibus model for pleasant emotion probes are displayed above. We first fit a series of dummy-coded variables that corresponded to our theorized patterns in the data in the base model. *Stress magnitude change* reflects the degree of emotion change from right after the stressor compared to baseline (i.e., before the stressor). *Recovery magnitude change* reflects the degree of emotion change during the recovery period on average compared to baseline. *Linear slope during recovery* (centered to the middle of the period) reflects the slope of emotion change during the recovery period. *Quadratic slope during recovery* (also centered to the middle of the period) reflects the quadratic curve of emotion change during the recovery period. For the omnibus model, we next added *recovery context* and *age group* at Level 2 of the model predicting each of the Level 1 intercepts and slopes. Recovery context was dummy coded as 1 (positive) and -1 (neutral). Age group was dummy coded as 1 (older adults) and -1 (younger adults). We estimated models with recovery context and age group and the interaction terms with stress reactivity and recovery at Level 2. Neither the quadratic effects nor the three-way interactions were significant. We therefore re-estimated the model and removed the quadratic effects and three-way interactions term to retain the simpler model, which are reported above.

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

Table S5.

Results for Model Referent to Stress Magnitude Change for Unpleasant Emotion Probes

Model Effects	Estimate	SE	df	t	p
Intercept	40.66	3.90	177.77	10.42	< .001***
Linear Slope during Recovery	-0.66	1.14	167.00	-0.58	.561
Quadratic Slope during Recovery	5.56	0.55	339.00	10.15	< .001***
Age Group	-9.28	5.42	167.46	-1.71	.089
Recovery Context	-9.56	5.39	167.46	-1.77	.078
Linear Slope during Recovery x Age Group	-4.69	1.31	167.00	3.59	< .001***
Linear Slope during Recovery x Recovery Context	-6.69	1.31	167.00	-5.12	< .001***
Age Group x Recovery Context	4.69	7.59	166.02	0.62	.538

Note. Model summary results for model reference to stress magnitude change (rather than referent to baseline as in Table S4) for unpleasant emotion probes. In this model, we assessed linear and quadratic slopes starting from the stressor period to the recovery period (excluding baseline data points). This allowed us to examine the extent to which individuals recovered from the stress period to the recovery period not relative to age differences at baseline.

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