

Association of Autonomic Activation with Traumatic Recall Challenges in Posttraumatic Stress Disorder: A co-twin control study

Supplemental Material

Supplemental Text 1

Neural Script:

John Smith took his yearly vacation every year in May. He took one whole week and traveled to a different beach each year. This year John decided to go to Miami Beach. When he awoke on his first day he saw nothing but sunshine. The temperature was perfect, about 80 degrees and no humidity. He could hear the waves coming up on the shore. He ate his breakfast and drank his coffee out on his patio that overlooked the ocean. John watched the dolphins swim by in the crystal clear water. It looked like a giant bath tub surrounded by white beautiful sand. John took a boat out to the reef for a little snorkeling. He saw the most amazing fish with the brightest colors, it was breathtaking.

After snorkeling, John was very hungry. He decided to eat at a local restaurant that was recommended by the hotel staff. It was a seafood restaurant right next to the ocean. He listened to the seagulls and felt the ocean breeze as he ate his shrimp that he ordered as an appetizer. It was delicious.

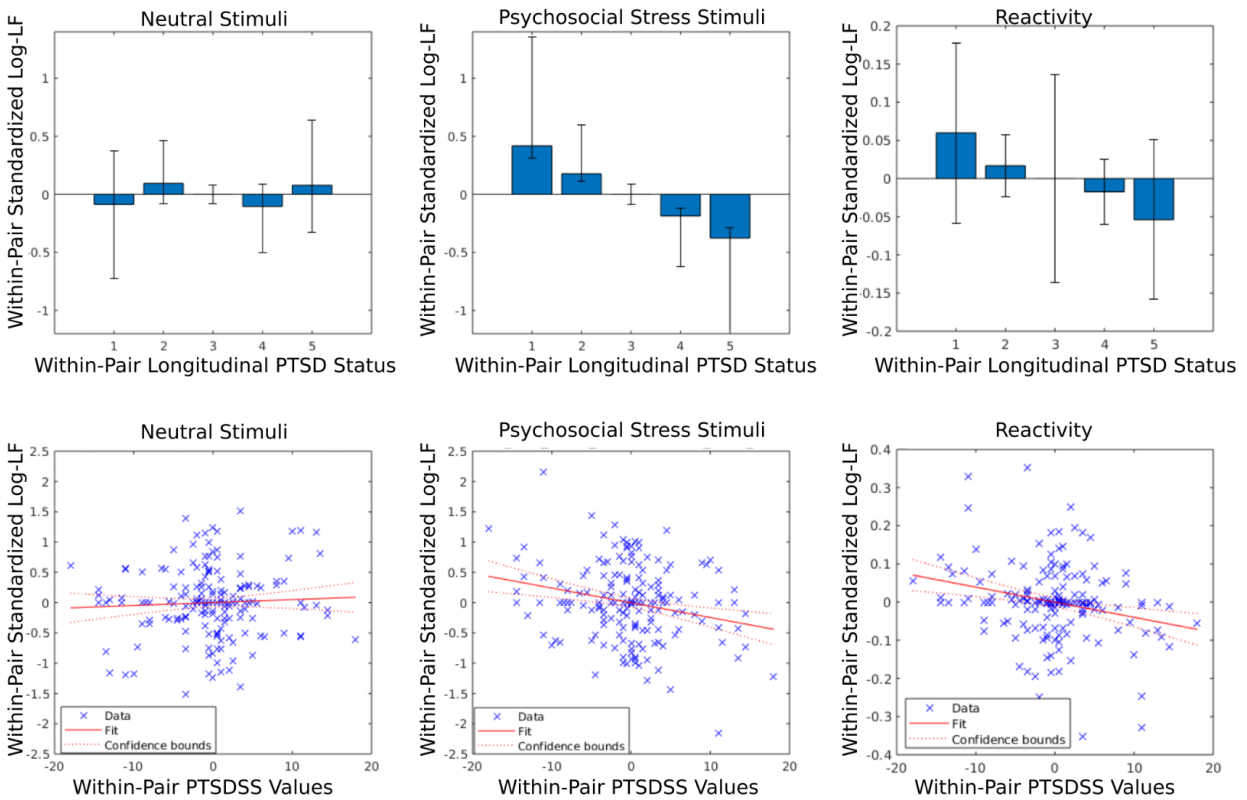
After dinner, John took a walk along the beach and watched the beautiful orange sunset over the ocean and reminisced on all the beautiful sights he had seen and experienced today.

Trauma remainder script example:

My oldest grandson was in a car accident that he was killed in. That was the hardest thing that I have ever experienced. It was so hard on my daughter and I. I couldn't do anything for her and her family. It's been almost 3 years, and we all are doing better, but something that never goes away.

On [DATE], I woke up and found my wife lying in bed with me, and I realized she was having a stroke. I called 911 and tried to comfort her while waiting for the medical people to show up. I remember the terror in her eyes as she tried to talk to me and couldn't. Then I had to call our children to tell them what had happened to their mother. She passed away three days later with me and her children with her. That was one and only really bad weeks of my whole life.

Supplemental Figure 1



Supplemental Figure 1. Within-pair longitudinal PTSD status and PTSDSS vs HRV. Outcomes include within-pair standardized log-transformed low frequency (Log-LF) values during neutral stimuli (left panels), traumatic stress stimuli (center panels), and HRV reactivity, which is the difference between stress and neutral phases. Within-pair longitudinal PTSD status is the exposure of interest in the top panels, and Within-pair PTSDSS is the exposure of interest in the bottom panels.

Supplemental Figure 2

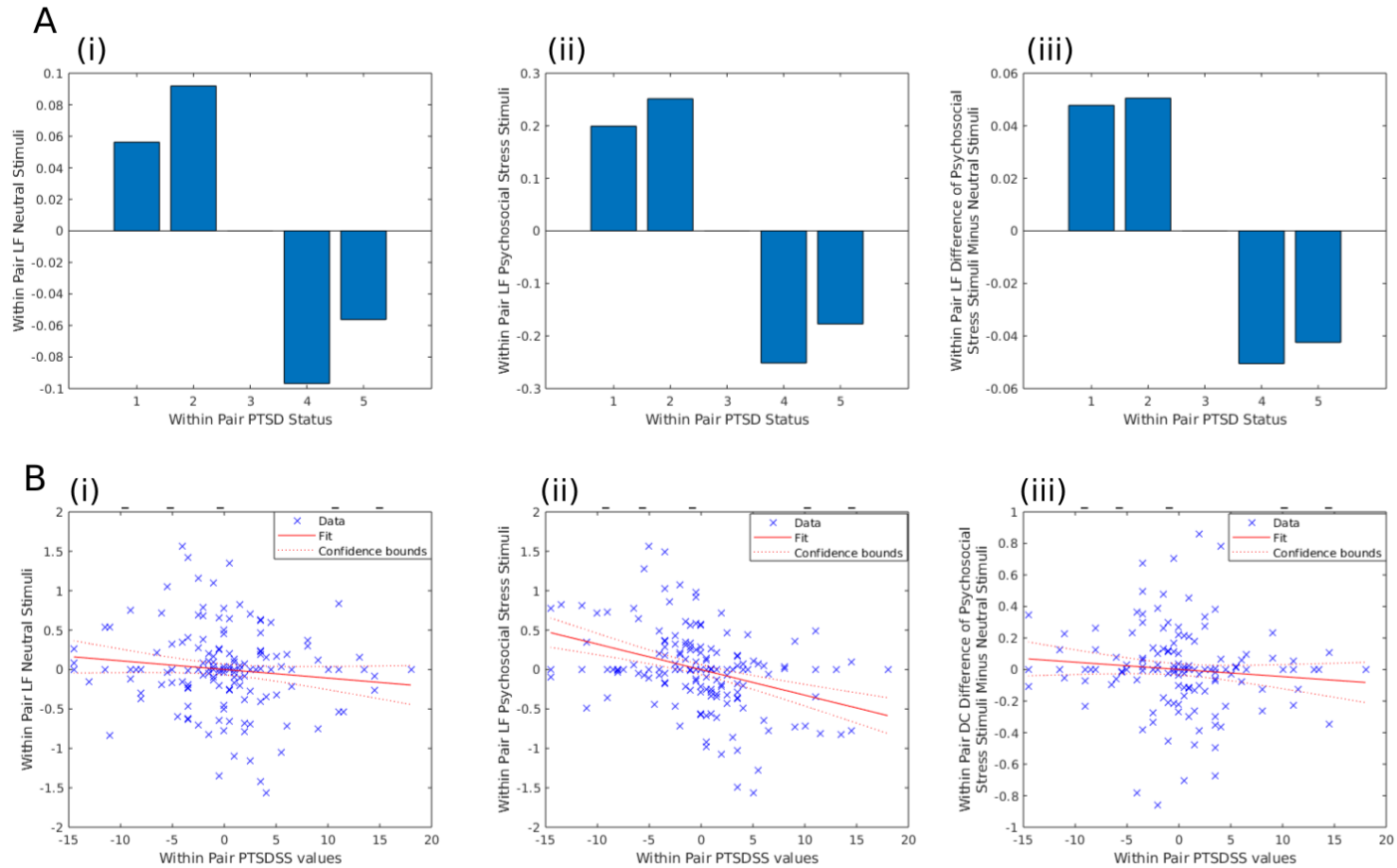


Figure 2. Within-pair longitudinal PTSD status and PTSDSS vs HRV. Outcomes include within-pair standardized deceleration capacity (DC) values during neutral stimuli (left panels), traumatic stress stimuli (center panels), and HRV reactivity, which is the difference between stress and neutral phases. Within-pair longitudinal PTSD status is the exposure of interest in the top panels, and Within-pair PTSDSS is the exposure of interest in the bottom panels.

Supplemental Table 1

Supplemental Table 1. Multivariable Within-Pair Analysis of the Relationship Between Longitudinal PTSD Status and Heart Rate During Neutral Stimulus, Psychological Stress Stimulus, and Its Change/Reactivity

Outcome: HR (N=106 Twin Pairs, 24 Late-Onset PTSD Discordant Pairs, 10 Long-Standing PTSD Discordant Pairs)

Within-Pair Difference in Heart Rate During Neutral stimuli					
	Late-onset PTSD vs Never PTSD		Long-standing PTSD vs Never PTSD		
Model	Mean	95% CI	Mean	95% CI	<i>p</i> for trend
Model 1 ^a	0.18	-0.13 to 0.49	0.41	-0.03 to 0.85	0.03
Model 2 ^b	0.1	-0.20 to 0.40	0.29	-0.16 to 0.74	0.16
Model 3 ^c	0.04	-0.26 to 0.35	0.43	-0.05 to 0.91	0.13

Within-Pair Difference in Heart Rate During Psychosocial stress stimuli					
	Late-onset PTSD vs Never PTSD		Long-standing PTSD vs Never PTSD		
Model	Mean	95% CI	Mean	95% CI	<i>p</i> for trend
Model 1 ^a	0.3	0.01 to 0.58	0.09	-0.33 to 0.50	0.13
Model 2 ^b	0.25	-0.03 to 0.53	-0.04	-0.47 to 0.39	0.20
Model 3 ^c	0.23	-0.05 to 0.52	0.12	-0.35 to 0.58	0.19

Within-Pair Difference in Heart Rate Reactivity					
	Late-onset PTSD vs Never PTSD		Long-standing PTSD vs Never PTSD		
Model	Mean	95% CI	Mean	95% CI	<i>p</i> for trend
Model 1 ^a	0.03	-0.29 to 0.36	-0.88	-1.35 to -0.42	<0.01
Model 2 ^b	0.10	-0.22 to 0.42	-0.95	-1.42 to -0.48	<0.01
Model 3 ^c	-0.01	-0.33 to 0.32	-1.09	-1.60 to -0.58	<0.01

Abbreviations: HR: heart rate; BMI: body mass index; CI: confidence intervals;

^a Base model was unadjusted for within-pair difference.

^b Model 2 = Model 1 + sociodemographic and traditional risk factors, including BMI, education, employment status, smoking, history of hypertension, diabetes, and beta blockers.

^c Model 3 = Model 2 + alcohol abuse, depression, alcohol abuse, anti-depression medication.

Supplemental Table 2

Supplemental Table 2. Within pair analysis of the association between longitudinal PTSD Status and PTSDSS with heart rate and HRV metrics in fully adjusted models that are mutually adjusted for both exposure types (PTSD duration and severity) (N=105 Twin Pairs, 24 Discordant Pairs)

	Estimate ^a (95% CI)	P values
HR neutral stimuli	0.13 (0.33,-0.08)	0.21
HR stress stimuli	0.07 (0.25,-0.11)	0.45
HR reactivity	-0.29 (-0.09,-0.49)	<0.01
DC HRV neutral stimuli	0.22 (0.43,0.00)	0.046
DC HRV stress stimuli	-0.21 (-0.01,-0.41)	0.04
DC HRV reactivity	-0.39 (-0.15,-0.63)	<0.01
Log-LF HRV neutral stimuli	0.16 (0.38,-0.05)	0.12
Log-LF HRV stress stimuli	-0.26 (-0.03,-0.49)	0.03
Log-LF HRV reactivity	-0.09 (-0.04,-0.14)	<0.01

Abbreviations: HR: heart rate; DC: deceleration capacity; Log-LF: log-transformed low frequency; PTSDSS: post-traumatic stress disorder symptoms scale; CI: confidence intervals; BMI: body mass index;

^a Model with PTSDSS: Longitudinal PTSD Status = HRV metric + sociodemographic and traditional risk factors, including BMI, education, employment status, smoking, history of hypertension, diabetes, and beta blockers + alcohol abuse, depression, alcohol abuse, anti-depression medication + PTSDSS

Supplemental Table 3

Supplemental Table 1. Multivariable Within-Pair Analysis of the Relationship Between Longitudinal PTSD Status and High frequency During Neutral Stimulus, Psychological Stress Stimulus, and Its Change/Reactivity

Outcome: HRV metrics (N=106 Twin Pairs, 25 PTSD-Discordant Pairs)

Model	Within-Pair Difference in hf During Neutral stimulus				
	Late-Onset PTSD vs. No PTSD		Long-standing PTSD vs. No PTSD		<i>p</i> for trend
	Mean	95% C.I.	Mean	95% C.I.	
<i>Model 1^a</i>	-0.36	-0.74 to 0.02	-0.22	-0.66 to 0.23	<0.01
<i>Model 2^b</i>	-0.35	-0.72 to 0.02	-0.21	-0.65 to 0.23	<0.01
<i>Model 3^c</i>	-0.30	-0.70 to 0.10	-0.14	-0.63 to 0.36	0.49

Model	Within-Pair Difference in hf During Psychosocial stress stimulus				
	Late-Onset PTSD vs. No PTSD		Long-standing PTSD vs. No PTSD		<i>p</i> for trend
	Mean	95% C.I.	Mean	95% C.I.	
<i>Model 1^a</i>	-0.28	-0.77 to 0.21	-0.18	-0.75 to 0.40	0.09
<i>Model 2^b</i>	-0.25	-0.72 to 0.23	-0.10	-0.67 to 0.47	0.13
<i>Model 3^c</i>	-0.27	-0.77 to 0.24	-0.15	-0.78 to 0.49	0.14

Model	Within-Pair Difference in hf Reactivity				
	Late-Onset PTSD vs. No PTSD		Long-standing PTSD vs. No PTSD		<i>p</i> for trend
	Mean	95% C.I.	Mean	95% C.I.	
<i>Model 1^a</i>	0.20	-0.14 to 0.54	0.00	-0.39 to 0.39	0.09
<i>Model 2^b</i>	0.22	-0.12 to 0.55	0.04	-0.36 to 0.44	0.06
<i>Model 3^c</i>	0.10	-0.23 to 0.46	-0.16	-0.60 to 0.29	0.43

Abbreviations: hf: high frequency; BMI: body mass index; CI: confidence intervals;

^a Base model was unadjusted for within-pair difference.

^b Model 2 = Model 1 + sociodemographic and traditional risk factors, including BMI, education,

employment status, smoking, history of hypertension, diabetes, and beta blockers.

^c Model 3 = Model 2 + alcohol abuse, depression, alcohol abuse, anti-depression medication.

Supplemental Table 4

Supplemental Table. Within pair analysis of the association between PTSDSS 10 points increment and HRV metrics (N=105 Twins pairs).

	Model 1^b	Model 2^c	Model 3^d
	Estimate ^a (95% CI)	Estimate ^a (95% CI)	Estimate ^a (95% CI)
HF HRV neutral stimuli	-0.13 (-0.26,-0.01)*	-0.09 (-0.21,0.04)	-0.03 (-0.16,0.09)
HF HRV stress stimuli	-0.17 (-0.29,-0.05)*	-0.14 (-0.27,-0.01)*	-0.13 (-0.27,0.00)
HF HRV reactivity	0.01 (0.06,-0.05)	-0.02 (-0.07,0.02)	-0.05 (-0.10,0.00)
RMSSD neutral stimuli	-0.11 (-0.24,0.01)	-0.02 (-0.13,0.09)	0.04 (-0.07,0.15)
RMSSD stress stimuli	-0.26 (-0.13,-0.40)**	-0.20 (-0.33,-0.06)*	-0.18 (-0.33,-0.04)*
RMSSD reactivity	-0.07 (-0.18,0.05)	-0.12 (-0.22,-0.02)*	-0.19 (-0.29,-0.08)*

Abbreviations: HF: high frequency; RMSSD: root mean square of successive differences between normal heartbeats; PTSDSS: post-traumatic stress disorder symptoms scale; CI: confidence intervals; BMI: body mass index;

^a Results are shown as β coefficients in the mixed models, per 10 units of increase of PTSDSS score.

^b Base model was unadjusted for within-pair difference.