Supplemental Material

Method

Coding of individual task performance. The present study was designed to examine physiological stress responses; however, we also explored whether performance on the individual task was impacted by the experimental manipulation. Following the coding procedure employed in Oveis et al. (2020), for each 30-second segment of the individual performance task, four trained coders (blind to hypotheses and experimental condition) independently rated the presenter on two 0 (*worst*) to 6 (*best*) scales: quality of the ideas pitched and quality of nonverbal aspects of the pitch (i.e., presentation style). Raters also provided an overall performance score on the same 0 to 6 scale for the entire pitch for each participant. Coders overlapped on 20% of the corpus of video recordings (40 videos), and showed excellent inter-rater reliability in their ratings (alphas: ideas = .92, nonverbal = .93, and overall score = .91). Averaged ratings of quality of ideas and quality of nonverbal aspects, as well as the overall score, were retained for analysis.

Results

Physiological. Please see Table S1 for descriptive statistics for PEP, CO, TPR, systolic blood pressure, and diastolic blood pressure across the experiment.

Analyses using alternate computation of challenge-threat index as used by Blascovich et al., 2004, Hangen et al., 2019, and Seery et al., 2010. For comparison with previous work, we computed a separate challenge-threat index by z-scoring reactivity measures of CO and TPR, and then subtracting TPR from CO.

During the collaborative task, collapsing across conditions, participants showed significantly more threat-patterned physiological responses compared to baseline, $t(174) = -9.96$,

$p < .001$, 95% CI [-0.93, -0.62]. Gratitude expressions (M = -0.59, SD = 1.13) produced more challenge-patterned physiological responses compared to the control condition (M = -0.96, SD = 0.88), as measured by challenge-threat index reactivity, $F(1,88) = 5.40$, $p = .022$, 95% CI [0.83, 1.12], $d = .36$.

During the individual performance task, collapsing across conditions, participants did not show significantly different challenge-threat index values compared to baseline, $t(155) = 1.59$, $p = .114$. Gratitude expressions (M = 0.46, SD = 1.71) produced more challenge-patterned physiological responses compared to the control condition (M = -0.10, SD = 1.12), as measured by challenge-threat index reactivity, $F(1,85) = 5.73$, $p = .019$, 95% CI [0.09, 1.02], $d = .38$.

Table S1. *Raw Score Descriptive Statistics for Physiological Variables*

		Expresser				Receiver			
		Control		Gratitude		Control		Gratitude	
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Baseline recording	PEP	112.74	21.10	117.49	18.27	117.29	16.76	116.51	18.06
	CO	8.38	3.59	7.70	3.59	8.18	4.17	7.57	3.03
	TPR	903.58	455.39	991.90	480.93	923.88	455.02	996.02	502.84
	Systolic	112.59	10.30	111.66	10.12	109.59	10.61	111.29	11.14
	Diastolic	61.22	6.62	60.76	6.83	58.85	6.95	60.25	6.73
Collaborative work task	PEP	105.80	20.86	110.31	18.87	107.77	19.91	105.65	18.60
	CO	8.23	3.79	7.56	3.13	8.13	3.72	8.22	4.11
	TPR	1012.47	506.18	1058.08	523.08	1024.42	550.53	1036.05	518.92
	Systolic	124.62	15.76	119.30	11.42	123.16	14.96	122.15	17.08
	Diastolic	65.92	12.94	64.03	12.61	65.06	10.11	66.58	11.03
Individual performance task	PEP	93.46	22.07	98.70	20.80	93.65	19.12	90.64	23.05
	CO	8.87	3.98	8.78	4.27	9.41	4.60	9.48	4.89
	TPR	967.82	524.04	925.12	391.60	837.09	367.80	915.63	405.44
	Systolic	131.57	20.40	135.52	18.56	135.35	16.44	138.60	20.42
	Diastolic	76.58	16.97	77.39	15.16	73.78	15.24	82.08	16.82

Note. PEP is measured in milliseconds; CO is measured in liters per minute; TPR is measured in dyne-seconds/cm^5.

Blood pressure. During the collaborative work task, gratitude dyads (M = 9.25, SD = 11.01) and control dyads (M = 12.80, SD = 12.33) did not significantly differ in systolic blood pressure reactivity, $F(1,68) = 3.19$, $p = .788$. Nor did gratitude dyads (M = 4.80, SD = 11.00) and control dyads (M = 5.46, SD = 9.36) significantly differ in diastolic blood pressure reactivity, $F(1,139) = 0.15$, $p = .703$.

During the individual performance task, gratitude dyads (M = 25.69, SD = 18.04) and control dyads (M = 22.70, SD = 16.83) did not significantly differ in systolic blood pressure reactivity, $F(1,69) = 0.95$, $p = .333$. Nor did gratitude dyads (M = 19.30, SD = 15.55) and control dyads (M = 15.27, SD = 15.23) significantly differ in diastolic blood pressure reactivity, $F(1,133) = 2.30$, $p = .132$.

Exploratory analyses of effects on expressers and receivers separately. The following analyses should be considered exploratory and underpowered: With the present sample size, a sensitivity test in G*Power software v3.1.9.2 indicated 64% power to detect effects of $d = .50$.

Collaborative work task. Gratitude *receivers* (M = 0.19, SD = 2.36) showed significantly less threat-patterned cardiovascular responding compared to control receivers (M = -0.70, SD = 1.37), $F(1,86) = 4.74$, $p = .032$, $b = 0.90$, 95% CI [0.08, 1.71], as indicated by the challenge-threat index (see Figure S1, Panel A). Gratitude receivers (M = 0.67, SD = 2.63) showed marginally greater CO reactivity than control receivers (M = -0.17, SD = 1.37), $F(1,86) = 3.61$, $p = .061$. Gratitude receivers (M = 44.08, SD = 213.36) showed marginally lower TPR reactivity than control receivers (M = 125.64, SD = 187.23), $F(1,86) = 3.63$, $p = .060$.

Gratitude *expressers* (M = -0.10, SD = 1.44) did not show significantly different challenge-threat index values compared to control expressers (M = -0.48, SD = 1.04), $F(1,84) = 1.58$, $p = .171$. Nor did gratitude expressers (M = 0.11, SD = 1.11) show significantly different

CO reactivity than control expressers (M = - 0.05, SD = 0.86), $F(1,85) = 0.53$, $p = .460$. Nor did gratitude expressers (M = 35.49, SD = 221.75) show significantly different TPR reactivity than control expressers (M = 92.06, SD = 147.31), $F(1,84) = 1.94$, $p = .167$.

Individual performance task. Gratitude receivers (M = 1.28, SD = 2.09) showed marginally more challenge-patterned cardiovascular responding compared to control receivers (M = 0.60, SD = 1.21), $F(1,78) = 3.10$, $p = .082$, as indicated by the challenge-threat index (see Figure S1, Panel B). Gratitude receivers (M = 2.09, SD = 3.43) did not show significantly different CO reactivity than control receivers (M = 1.22, SD = 1.85), $F(1,85) = 2.19$, $p = .143$. Nor did gratitude receivers (M = -96.74, SD = 238.81) show significantly different TPR reactivity than control receivers (M = -39.13, SD = 162.41), $F(1,78) = 1.68$, $p = .200$.

Gratitude expressers (M = 0.66, SD = 1.50) did not show significantly different challenge-threat index reactivity compared to control expressers (M = 0.14, SD = 1.21), $F(1,74) = 2.13$, $p = .148$. Nor did gratitude expressers (M = 1.32, SD = 1.67) show significantly different CO reactivity than control expressers (M = 0.95, SD = 1.68), $F(1,83) = 1.02$, $p = .315$. Nor did gratitude expressers (M = -34.41, SD = 232.09) show significantly lower TPR reactivity than control expressers (M = 34.30, SD = 156.91), $F(1,74) = 2.14$, $p = .149$.

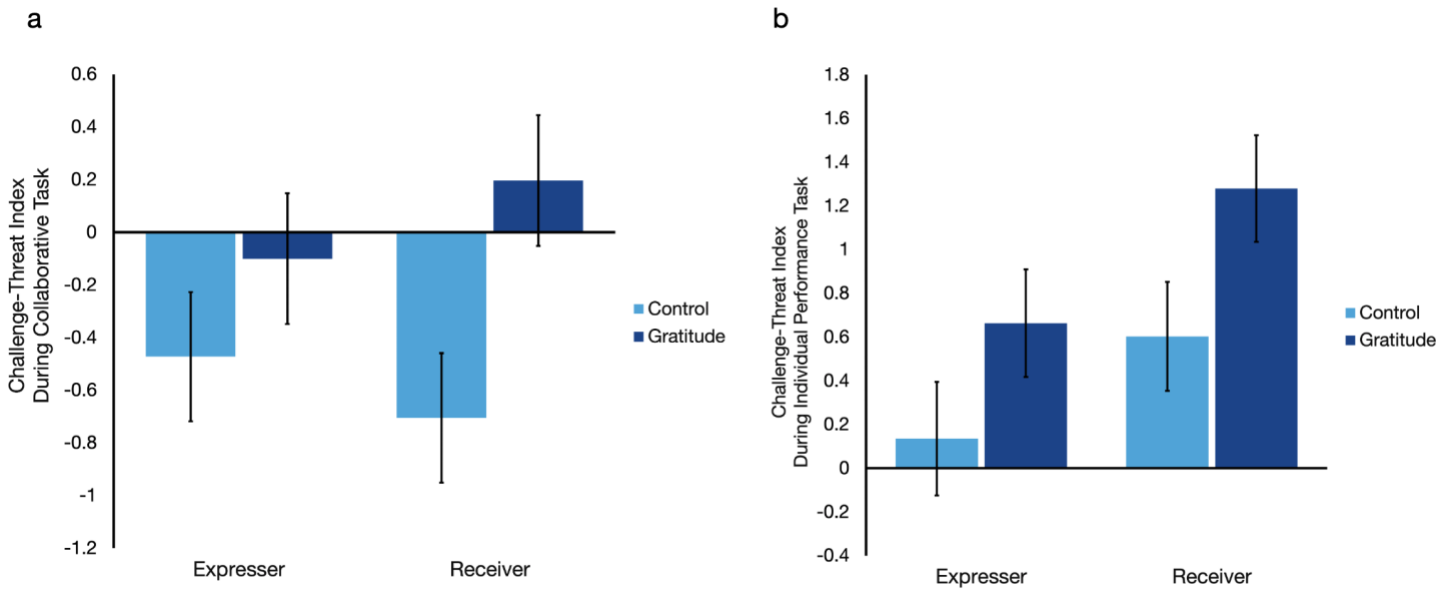

Figure S1. Challenge-threat index during the collaborative work task (Panel A) and individual performance task (Panel B), presented separately for expressers and receivers. Error bars represent one standard error.

Task Performance. Challenge-threat index during the collaborative task significantly and positively predicted task performance on all three metrics: quality of ideas (b = 0.18, 95% CI [0.03, 0.33], $F(1,167.9) = 5.65$, p = .017), quality of nonverbal aspects (b = 0.23, 95% CI [0.08, 0.38], $F(1,166.6) = 9.53$, p = .002), and overall performance (b = 0.21, 95% CI [0.06, 0.36], $F(1,168) = 7.51$, p = .006). As well, challenge-threat index during the individual task significantly and positively predicted task performance on all three metrics: quality of ideas (b = 0.17, 95% CI [0.01, 0.32], $F(1,150.3) = 4.32$, p = .038), quality of nonverbal aspects (b = 0.22, 95% CI [0.06, 0.37], $F(1,147.8) = 7.78$, p = .005), and overall performance (b = 0.19, 95% CI [0.03, 0.34], $F(1,151) = 5.76$, p = .016) (see Figure S2).

The gratitude and control conditions did not differ significantly in quality of ideas ($F(1,92) = 0.003$, $p = .956$), quality of nonverbal aspects ($F(1,92) = 0.19$, $p = .663$), or overall performance ($F(1,92) = 0.07$, $p = .784$). Experimental condition did not moderate the relationships between collaborative task challenge-threat index and quality of ideas ($F(1,165.29) = 0.16$, $p = .685$), quality of nonverbal aspects ($F(1,161.18) = 0.0003$, $p = .985$), or overall performance ($F(1,166) = 0.17$, $p = .677$). Nor did experimental condition moderate the relationships between individual task challenge-threat index and quality of ideas ($F(1,133.15) = 0.36$, $p = .550$), quality of nonverbal aspects ($F(1,128.29) = 1.43$, $p = .233$), or overall performance ($F(1,149) = 1.48$, $p = .226$).

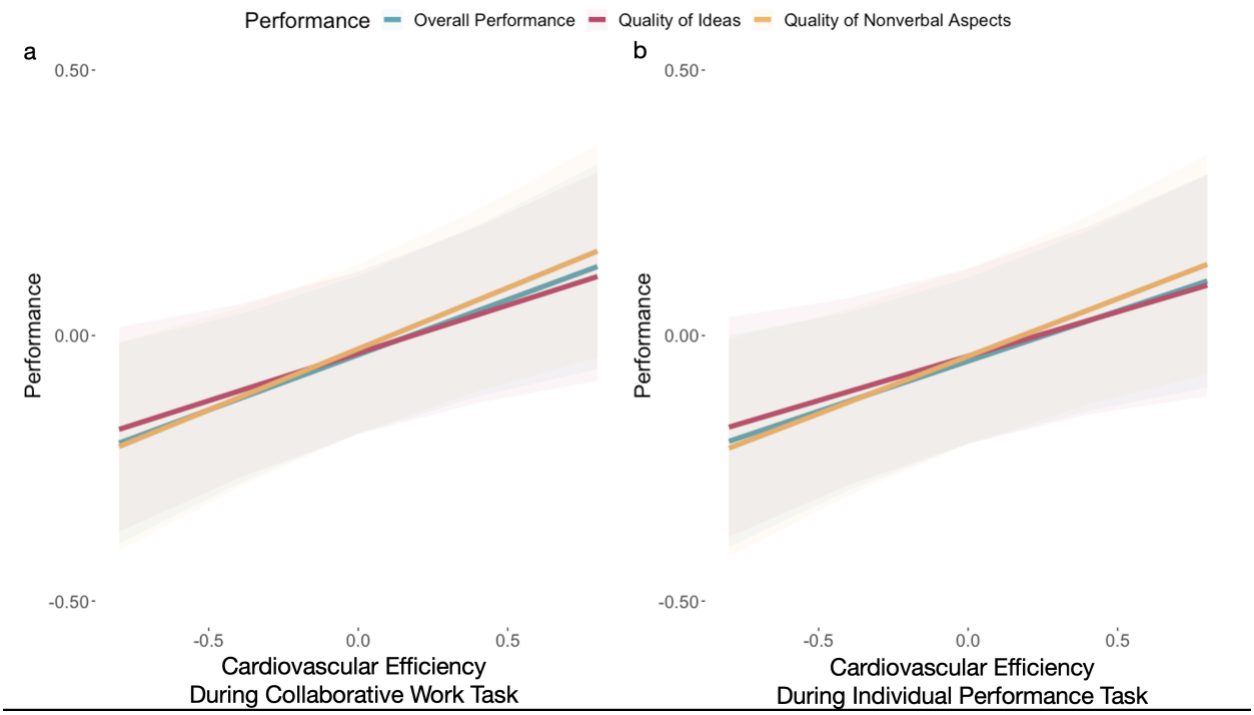

Figure S2. Correlations of task performance with collaborative task challenge-threat index (Panel A) and individual task challenge-threat index (Panel B).

Collaborative Work Task Instructions

Part 1 of your pitch will focus on describing the UCSD Bicycle. This 3-min portion of the presentation should cover the following details:

1) The Product
    a. Key features and price
    b. Design innovations
    c. Who and how big is the target market?
    d. What problem is the product solving for the customer? Why will they want to purchase the UCSD Bicycle?

2) Present a timeline for all key milestones, including when the product will be profitable

Part 2 of your pitch will focus on the marketing plan for the UCSD Bicycle. This 3-min portion of the presentation should cover the following details:

1) The Marketing Plan
    a. What is your plan?
    b. Where/how will you advertise?
    c. How will you allocate your marketing budget?
    d. How will this product help promote the UCSD brand?

2) Why are you the best team to lead this initiative?

Remember,
-Each of you should prepare to present both parts of the presentation; we will assign one of you to Part 1 at the start of the presentation period.
-You will give your presentation to trained evaluators, and your team's performance will be assessed based on the quality and originality of ideas, and how clearly and effectively you present your pitch.